Hassayampa Landscape Restoration Project

Biological Assessment

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Cover Photo:

Hassayampa Project Area from Mount Union Lookout. Photo by Noel Fletcher, USFS, PNF

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Introduction

This biological assessment discloses affected environment information and environmental consequences analysis for Endangered Species Act (ESA) species and habitats as they relate to fuels reduction treatments (prescribed fire, mastication, mechanical thinning, hand thinning, fuel breaks, and associated actions including temporary roads construction) associated with the Hassayampa Landscape Restoration Project.

Wildlife habitat improvement is associated with the purpose and need for the Hassayampa Landscape Restoration Project. The overall purpose of this project is to return fire to its natural role in the ecosystem, to meet desired conditions of potential natural vegetation types across the Forest, and to protect life and property from catastrophic wildfires. As such, the underlying needs for action are to:

- Improve the health and resiliency of fire-adapted ecosystems by restoring and maintaining fire to a more natural role;
- Reduce fire hazards in strategic locations to improve fire protection and human safety around communities within the project area; and
- Improve the quality of wildlife habitat while reducing the risk of catastrophic fire.

Achieving this purpose and need for action would help to restore the landscape by improving the health and resiliency of the fire-adapted ecosystems. This project implements the Land and Resource Management Plan for the Prescott National Forest of 2015 (Forest Plan) and moves the landscape towards the desired conditions outlined in the plan. This project includes applying habitat management objectives and species protection measures from the Mexican spotted owl Recovery Plan, First Revision, to the appropriate activities.

Treatments within Mexican spotted owl habitat were an issue identified during public scoping. Several commenters expressed concern that treatments within Mexican spotted owl habitat could negatively impact owls or their habitat, particularly critical habitat and protected activity centers. The project area includes all or part of 12 of 17 protected activity centers across the Forest and covers a large portion of the project area. This issue was used to develop and refine the proposed action and resource protection measures, and to design the effects analysis. The original prescriptions were modified to reflect FWS input for basal area ranges for PNVTs.

The proposed action includes two of three specific actions requested by commenters:

- No new permanent road construction is proposed as part of this project. No new temporary roads would be constructed within any Mexican spotted owl protected activity centers. Old, existing temporary roads and non-system roads may be used in the protected activity centers, if needed. These roads would be rehabilitated upon completion of all harvest activities. This approach is consistent with the Mexican Spotted Owl Recovery Plan (U.S. Fish and Wildlife Service [USDI USFWS] 2012).
- The resource protection measure (environmental assessment, appendix A, C-11, C-4) avoids disturbance in Mexican Spotted Owl Protected Activity Centers including the Core Areas during the March 1–August 31 nesting season where owls are nesting. In addition, per the biological opinion for the Forest Plan, there would be a 0.25-mile buffer breeding season (March 1- August 31) timing restriction beyond the perimeter of each Mexican spotted owl protected activity center.

The third specific action requested by commenters, exclude thinning and mastication treatments from protected activity centers, would prevent the purpose and need for action from being achieved within those areas. Therefore, this was not included in the resulting selected action alternative.

Federally listed aquatic species and/or suitable habitat present in the Hassayampa project area or that the project potentially affects includes the Gila trout. There is no designated critical habitat for the Gila trout.

This biological assessment was developed after considering the best available science for assessing resource conditions and then determining the ecological effects associated with project activities.

Summary of Determinations

Table 1 summarizes the determinations of effects of Hassayampa Project proposed actions on Endangered Species Act species and critical habitats. Determinations for all other listed species or habitats for the Prescott National Forest were "No Effect" as reported in the respective aquatic and terrestrial specialist reports.

Table 1. Summary of effects determinations for federally listed species and habitats

Species	Status	Determination	Rationale
Mexican spotted owl	Threatened	May affect and is likely to adversely affect.	This species is documented within the project area. Proposed activities are likely to disturb individuals and modify their key habitat components.
Mexican spotted owl critical habitat	Designated	May affect and is likely to adversely affect.	Mexican spotted owl critical habitat occurs within the project area. PCEs will be negatively impacted by this project.
Gila trout	Threatened	May affect and is not likely to adversely affect.	This species is documented within the project area.

Selected Alternative

Alternative 2–Selected Action The Forest is proposing to reduce fuels and restore fire as an ecological process on approximately 234,515 acres. Opportunities for treatments tare proposed in a variety of potential natural vegetation types (PNVTs) including Semi-Desert Grasslands, Juniper Grasslands, Piñon-Juniper Evergreen Shrub, Interior Chaparral, Ponderosa Pine-Evergreen Oak, Ponderosa Pine-Gamble Oak Desert Communities, and Riparian Gallery Forest. PNVT is the Forest Plan terminology used to refer to and differentiate among the various vegetation types. Dry mixed conifer sites are included in the Ponderosa Pine-Oak PNVTs and would be treated as part of this project. A discussion of dry mixed conifer vegetation type and its management is on page 8. A variety of methods are being considered to reduce fuels and create and maintain healthy and resilient ecosystems, including hand thinning or pruning, prescribed burning, and mechanized and non-mechanized fuel reduction treatments. A combination of vegetation management treatments, including mechanized and non-mechanized fuels treatments, prescribed burning, and fuel break construction, would be used to attain desired conditions.

The treatments being proposed are based on the existing conditions of vegetation being managed and the desired conditions for those areas. Prescribed burning is proposed on approximately 234,276 acres of the project area; this includes all PNVTs except desert communities. A combination of treatments would occur through the project area. Areas that are mechanically thinned, including within the fuel break treatments, may also have mastication and prescribed burning treatments. Areas that are masticated are anticipated to have prescribed burning treatments. Hand thinning areas would not be masticated; no mechanical treatments would occur. Hand thinning, pile, pile burning, and prescribed burning are

anticipated within all treatments types. The possible combination of treatments are described further in each section. The timing of implementing these treatments will be dependent upon a wide array of factors including vegetation conditions, weather, personnel availability, budgets, and forest priorities.

Fuels would be reduced using a variety of treatment tools, including mastication, mechanical thinning, hand thinning, and fuel breaks. These treatments cover 90,861 acres of the project area (37 percent)[1]. These treatments are summarized in Table 2 and described below.

Table 2. Fuel reduction treatments	
Primary Treatment	**Acres**
Mastication	44,590
Mechanical thinning	30,808
Hand thinning	4,798
Fuel breaks (mechanical)	9,616
Fuel breaks (hand thinning)	1,049
Total	**90,861**

Mastication

Mastication (mechanized fuel reduction) is proposed primarily in Chaparral, Piñon-Juniper, and Evergreen Oak vegetation with slopes less than 40 percent grade or where these vegetation types occur in inclusions within other PNVTs. Mastication is accomplished with a rubber-tired or tracked vehicle with a power cutting head. It could also be accomplished with chainsaws. Treatments in chaparral would entail crushing, cutting, or mulching 40 to 70 percent of the existing vegetation and placing the cut material within 12 inches of the ground. This would allow for retention of 30 to 60 percent of existing vegetation, depending on proximity to wildland-urban interface and existing fuel conditions. Follow-up treatment for masticated areas would be prescribed burning or mechanical removal of activity slash (cut vegetation generated by treatments) from the treatment site, or a combination of the two. Prescribed burning to maintain treatments would be conducted as needed. Mastication will occur within these vegetation types where they occur within Mexican spotted owl habitat and critical habitat.

Mechanical Thinning

Thinning is proposed in stands of Ponderosa Pine, Pine-Oak, and dry Mixed-Conifer forest types to reduce fuel loading and improve forest health. Mechanical thinning would be implemented on approximately 30,808 acres. This would help create a residual stand structure and level of fuels that would reduce the potential for crown fire under typical weather conditions that occur in the project area.

Prescriptions and treatment objectives would focus on uneven-aged management silvicultural practices (group and individual tree selection) that include guidance identified in the Forest Plan for management of Mexican spotted owl habitat. Desired residual tree densities would average 40 to 70 square feet of basal area per acre at the stand level with group level tree densities ranging from 50 to 100 square feet of basal area per acre. Uneven-aged silvicultural practices require the removal of trees across all diameter classes, so large (>18” dbh)- and small (<9” dbh)-diameter trees would be cut. In many cases, the

[1] These treatment acres were calculated using the most current and complete GIS data available, and may vary slightly on the ground. No treatment acres would be greater than those identified here.

landscape is missing younger, small trees and larger, older trees; the prescriptions would try to recruit and enhance these age classes. These prescriptions would retain the largest trees in most cases. Large trees may need to be removed per Resource Protection Measure C-4 in Appendix A. Mechanical thinning operations will include winter logging. These treatments would include both conventional ground-based as well as steep slope, ground-based harvest systems, as described below.

Fuelbreak Construction

Fuelbreak construction is proposed on strategic areas adjacent to private property or key areas that would allow for protection of identified resources in the project area. These areas include the historic Palace Station, recreation residences, and other recreation sites of high interest. Constructing a fuelbreak is the process of selectively thinning and removing vegetation in strategically located places on the landscape, usually adjacent to private property or other high value resource. These fuelbreaks are not intended to contain fire activity, rather they affect fire behavior so that wildfires burning into them behave in such a manner that they can be more readily controlled. The proposed fuelbreaks would be linear in shape and up to 5 chains (330 feet) wide.

Forested fuelbreaks would be designed to have basal areas at the lower ends of the recommended densities described in the mechanized and non-mechanized sections above, unless the site is stocked exclusively with chaparral vegetation. In those cases, all chaparral vegetation would be removed. Sound snags would be retained while soft snags would be felled and create additional coarse woody material that would be eventually reduced to desired levels within a fuelbreak. All previously existing dead fuels and activity slash would be piled (by hand or machine) and burned, or if possible, removed. The fuelbreaks include 1,049 acres of hand thinning and 9,616 acres of mechanical thinning. The mechanical thinning would include both conventional ground-based and steep slope, ground-based harvesting systems implementing a thin from below prescription.

Fuelbreaks would be maintained by prescribed burning or by the vegetation manipulation treatments described above, with treatments occurring as needed. Mechanical maintenance would be based on the vegetation regrowth and is anticipated every 7 to 10 years. Maintenance burns would be implemented every 2 to 7 years, and in some cases every 10 years or more, depending on the ecological conditions. All maintenance activities would be implemented as funding allows within the Prescott National Forest budget.

Prescribed Fire

Prescribed burning is proposed on approximately 234,276 acres of the project area; this includes all National Forest System lands except the Desert Communities PNVT. Prescribed burning could occur year round as conditions allow. It is anticipated an average of 10,000 acres would be treated annually; however, annual treatments would be determined by the needs on the landscape and available funding. Prescribed fires are used under specific environmental conditions that allow the fire to play out its natural role and behavior within a predetermined area. Broadcast and pile burning would be tools used to treat the slash from other activities in the project area. As per Forest Plan direction, prescribed burning is preferred on slopes less than 40 percent. These acres overlap with the other fuel reduction treatments.

In association with prescribed fires, control lines would be constructed to aid in implementing individual prescribed fires. The construction of control lines would vary by vegetation type and physical structure. The location of control lines would not be site specifically determined until the burn plans for specific units are developed. Timing and location of control lines would be within the resource protection measures designed for this project. All fire control lines would be rehabilitated after project implementation.

Chaparral vegetation would be cleared up to 132 feet in width. These control lines would be constructed using a skid steer, chainsaw, or similar equipment; no bulldozers would be used. Within this area, a 2-foot wide control line down to bare mineral soil would be created using hand tools.

In all other vegetation types, woody shrubs, brush and small-diameter trees (less than 9 inches in diameter) would be cleared up to 66 feet in width. This would be accomplished using a skid steer, chainsaw, or similar equipment; no bulldozers would be used. Control lines would average 2-feet wide and would be cleared down to bare mineral soil.

It is expected that vegetation would return at varying rates which would facilitate a staggered maintenance program. Maintenance burns would be implemented every 2 to 7 years, and in some cases every 10 years or more, depending on the ecological conditions. Areas within the Goodwin Fire perimeter would receive maintenance burns in the future, based on these criteria. All maintenance activities would be implemented as funding allows within the Prescott National Forest budget.

Non-mechanized (Hand thinning) Fuel Reduction Treatments

Non-mechanized fuel reduction treatments are proposed where slopes have a grade greater than 80 percent as well as in sensitive sites. Non-mechanized fuel reduction treatments would be carried out by hand with chainsaws on trees up to 9” dbh. Juniper, piñon, and oak would be thinned along with the brush with an objective to retain 30 to 60 percent of the existing vegetation. Cut vegetation would be scattered, piled and burned, or possibly removed, as follow-up treatments. Materials would only be burned or removed after the materials needed for soil protection have been retained. Prescribed burning may be used as a follow-up treatment in thinned areas. The maintenance prescribed burning in these areas would occur as described in the prescribed burning section.

More details on the proposed action are found within the environmental assessment for this project.

Treatments within Specific Areas

Mexican Spotted Owl Habitat

One of the desired conditions in the Forest Plan includes frequent, low-severity fires, occurring every 1 to 15 years, in the Ponderosa Pine-Gambel Oak Forest, including throughout the range of Mexican spotted owls. Of the 17 Mexican spotted owl protected activity centers on the Forest, all or portions of 12 of them are within the project area, which provides an opportunity to move much of the Mexican spotted owl habitat areas towards historic reference conditions while maintaining key habitat components of Mexican spotted owl nesting and roosting habitat and improving foraging habitat quality. All the fuel reduction treatments are considered fire management tactics to reduce fire effects and retain and enhance key habitat elements of nest and roost habitat. All of these treatments described could occur within the Mexican spotted owl protected activity center including the cores. Treatment within the remaining protected activity center and recovery habitat would be designed to create heterogeneity (vertically and horizontally), species diversity among trees and understory species, and enhanced foraging habitat consistent with the desired conditions described in Table C.2 of the Mexican Spotted Owl Recovery Plan.

Table 3. Acres of aspen treatment within Mexican spotted owl habitat		
Treatment Type	**Current Aspen Stands (acres)**	**Potential Treatment of Aspen (acres)**
Inside Mexican spotted owl protected activity centers	8	27
Inside Mexican spotted owl core areas	10	20
Total	**18**	**47**

In addition, approximately 47 acres (Table 3) of aspen restoration treatments are proposed within the Mexican spotted owl protected activity centers. Aspen is generally associated with dense, dry mixed-conifer stands. Aspen, and the habitat that aspen provides, is extremely rare and unique to the Hassayampa Project area. More importantly, aspen health has been declining due to the combined effects of conifer encroachment, browsing, grazing, insects, disease, severe weather events, lack of fire disturbance, and climate change. This decline is of special concern because aspen does not commonly reproduce from seed, and thus, loss of an aspen clone may be the loss of a long-standing aspen presence not easily recovered. The desired conditions for this ecosystem type is: "In areas with aspen, Douglas-fir, and white fir present, trees typically occur in irregularly shaped groups, trees within groups are variably spaced, and group sizes generally range from a few trees up to 1.1 acres. Crowns of trees within the mid-aged to old groups are interlocking or nearly interlocking" (Forest Plan, DC-Veg-20, page 39). The proposed treatments would move the ecosystem towards these desired conditions. The potential treatment acres are greater than the current acres of aspen stands because the prescription provides for opening the tree canopies around the stands to allow sunlight to stimulate reproduction and sprouting. Along with removal of conifers, some large aspen may need to be removed to effectively stimulate regeneration within aspen clones. Prescribed fire would be used to stimulate aspen sprouting. Aspen treatments within Mexican spotted owl cores away from known nest sites would be designed to meet the desired conditions for nest roost habitat in Table C.2. of the Recovery Plan. These treatments are discussed in detail later in this document.

Grapevine Botanical Area Watershed

The Grapevine Botanical Area was designated in 1997 to protect the 12 perennial springs and associated Arizona alder-walnut vegetation community. The topographic features influencing the uniqueness of the vegetation include the narrow canyon, the easterly flow, and the steep gradient. The canyon is relatively narrow compared to adjacent creeks. The easterly orientation of the creek as well as the narrowness of the canyon have additive shading effects. The unique Arizona alder-Arizona walnut community extends downstream along Grapevine Creek for 2.4 miles. The perennial reach of Grapevine Creek begins at the Grapevine Springs complex and flows for about a mile within the Grapevine Botanical Area. Gila trout (threatened) were introduced into Grapevine Creek in 2009 as part of recovery actions for the species.

The treatments proposed within Grapevine Botanical Area include hand thinning and prescribed burning to restore and maintain the unique botanical features for which it was designated. These treatments would also protect the unique riparian communities. Given the impacts from the recent Goodwin Fire, no mechanical treatments would be implemented within this botanical area.

Resource Protection Measures

Resource protection measures are intended to assure that projects comply with resource protection standards and guidelines of the Prescott Land Management Plan, as well as other Federal and State laws, regulations, and policy. They are derived from the Forest Plan and other directives such as the Conservation Assessment and Strategy for the Bald Eagle in Arizona, as well as from best management

practice direction. Best management practice direction is identified in an intergovernmental agreement between the Arizona Department of Environmental Quality and the Forest Service. The Forest Plan includes guidance to apply protection measures from approved Recovery Plans for listed species to activities occurring within their respective habitats, which includes the MSO and its Recovery Plan. Resource protection measures would be incorporated into the design of the proposed action, as described above. They are intended to reduce, minimize, or eliminate impacts to various natural and human resources. Resource protection measures are located in Appendix A of the environmental assessment; those specific to terrestrial wildlife are located in Appendix A, section C, of the environmental assessment. They are also included in Appendix A of this document for the reader's convenience.

Relevant Laws, Regulations, and Policy

Regulatory Framework

Land and Resource Management Plan

The Prescott National Forest Land and Resource Management Plan (Forest Plan; USDA Forest Service 2015b) provides standards and guidelines for terrestrial wildlife on pages 76–78. Forest Plan terrestrial wildlife standards and guidelines relevant to this project have been incorporated into the project resource protection measures (Appendix A).

Relevant Desired Conditions for Mexican spotted owl and Gila trout

Terrestrial Wildlife (Landscape Scale: 10,000 acres or greater)

DC-Wildlife-1 (Forest Plan, page 43):

- Habitats that support populations of Southwestern Region Sensitive Species provide the ecological conditions that facilitate the life history, distribution, and natural population fluctuations of the species within the capability of the ecosystem.
- Fire plays a role in maintaining wildlife habitat for species associated with fire-adapted systems.
- Wildlife in habitats associated with animal movement corridors are free from human harassment.
- Terrestrial habitats are free of negative impacts from nonnative or feral species.

DC-Wildlife-2 (Forest Plan, page 44):

- Ecological conditions provide habitat for associated federally listed species. Habitat conditions generally contribute to survival and recovery, and contribute to the delisting of species under the Endangered Species Act (ESA) of 1973 (P.L. 93-205).
- Improved habitats for candidate and proposed species help preclude species listings as threatened or endangered under ESA.

PNVT Overview

Site-specific areas may be managed for different aspects of desired conditions because of particular resource and species needs. It may be desirable to have different desired conditions within a PNVT. The conditions described for each PNVT in the sections that follow are desired to restore and maintain vegetation structure and disturbance regimes and to increase ecosystem resilience or adaptive capacity of plant communities to accommodate expected changes imposed by future climate trends for the Southwest.

Ponderosa Pine-Evergreen Oak Forest

Landscape Scale

DC-Veg-13 (Forest Plan, pages 34–35):

Ponderosa Pine-Evergreen Oak PNVT forests are composed of structural stages ranging from young to old trees. Forest structure is variable but generally uneven aged and open in appearance. Areas of even-aged structure are present. The forest arrangement consists of small clumps and groups of trees interspersed within variably sized openings of moderate to high density shrubs and limited grass cover. The size, shape, and number of trees per group and the number of groups per area vary across the landscape. Tree density may be greater in some locations, such as north-facing slopes and canyon bottoms.

Vegetation composition resembles historic situations including ponderosa pine overstory. Evergreen oaks are well represented and juniper, piñon pine, and Arizona cypress can be found in the lower tree canopy. Understory species consist of evergreen shrubs (e.g., manzanita, turbinella oak, sumac species, mountain mahogany species) and grass as scattered ground cover.

Old growth occurs throughout the landscape, generally in small areas as individual old growth components or as clumps of old growth. Old growth components include old trees, snags, coarse woody debris (downed wood), and structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). The forest contains various stages of development (e.g., temporary openings or groups of very young trees) to provide future old growth within the landscape.

Fires of low severity and occasionally mixed severity, occurring every 6 to 12 years, are characteristic of this PNVT including throughout the range of northern goshawks.

Ponderosa Pine-Gambel Oak Forest[2]

Background

The dry mixed-conifer with Frequent Fire PNVT (which comprises 6,600 acres of the Prescott NF) was combined with the Ponderosa Pine-Gambel Oak Forest PNVT because they are described by the same vegetation structure and disturbance regimes. Species such as aspen, Douglas-fir, and white fir are typically present in these areas, along with ponderosa pine and Gambel oak. Species such as aspen, Douglas-fir, and white fir may be present, especially in relatively moist areas. There is typically an understory of grasses and forbs with occasional shrubs.

Desired condition descriptions for the Ponderosa Pine-Gambel Oak PNVT were refined considering information published in RMRS-GTR-310 (Forest Service, 2013). This publication is a synthesis of research findings for restoring the composition and structure in the frequent-fire forests of the Southwest and provides a science-based framework for improving ecosystem resiliency under a changing climate.

Landscape Scale

DC-Veg-17 (Forest Plan, pages 37–38):

[2] Includes dry mixed conifer vegetation type.

At the landscape scale, Ponderosa Pine-Gambel Oak PNVT forests have a mosaic of structural stages ranging from young to old trees. Forest structure is variable but generally uneven aged and open in appearance.

The forest arrangement consists of small clumps and groups of trees interspersed within variably sized openings of grasses, forbs, and shrubs. The size, shape, and number of trees per group and the number of groups per area vary across the landscape. Tree density may be greater in some locations, such as north-facing slopes and steep-sided valleys at higher elevation.

Vegetation conditions (e.g., composition, vertical and horizontal structure and arrangement) provide for the life history, distribution, and natural population fluctuations of native species within the capability of the landscape; especially those birds and mammals that rely on Ponderosa Pine-Gambel Oak PNVT forests for habitat (e.g., northern goshawks, Mexican spotted owls, turkeys, tassel-eared squirrels and other rodents).

Vegetation composition resembles historic situations including ponderosa pine overstory with Gambel oak occupying the lower tree canopy. Aspen or Gambel oak patches occur. There is typically an understory of grasses and forbs with occasional shrubs. Where it naturally occurs, Gambel oak is present with all age classes represented. It is reproducing to maintain its presence on suitable sites across the landscape.

Old growth occurs throughout the landscape, generally in small areas as individual old growth components, or as clumps of old growth. Old growth components include old trees, snags, coarse woody debris (downed wood), and structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). The forest contains various stages of development (e.g., temporary openings or groups of very young trees) to provide future old growth within the landscape.

Frequent, low-severity fires, occurring every 1 to 15 years, are characteristic of this forest including throughout the range of northern goshawks and Mexican spotted owls.

Mid-Scale
DC-Veg-18 (Forest Plan, page 38):

Ponderosa pine-Gambel oak forest is characterized by variation in the size and number of tree groups depending on elevation, soil type, aspect, and site productivity. The more productive sites contain more trees per group and more groups per area. Tree density within forested areas generally ranges from 10 to120 trees per acre and 20 to 80 square feet basal area per acre, with the greatest amount of basal area being contributed by larger trees. Interspaces surrounding tree groups, containing grass, forb, and shrub vegetation, is typically high ranging from 70 to 90 percent of the mid-scale area. Patches of even-aged forest structure are present.

In areas that contain aspen, Douglas-fir, and white fir, tree densities range from 30 to 100 square feet of basal area per acre and interspaces surrounding tree groups range from 50 to 70 percent of the midscale area.

Fine-Scale
DC-Veg-20 (Forest Plan, page 39):

In areas with aspen, Douglas-fir, and white fir present, trees typically occur in irregularly shaped groups, trees within groups are variably spaced, and group sizes generally range from a few trees up to 1.1 acres. Crowns of trees within the mid-aged to old groups are interlocking or nearly interlocking.

Grasslands

DC-Veg-21 (Forest Plan, page 40): Composition, structure, and cover provide habitat for native animals associated with grasslands, especially pronghorn antelope, ferruginous and Swainson's hawks, western burrowing owls, and western grasshopper sparrows.

Special Area Designations

The 771-acre Grapevine Botanical Area was designated by the Forest in 1997. This area encompasses the headwaters of the perennial Grapevine Creek and associated upland and riparian vegetation. The area represents a unique resource on the Forest located within the Crown King Management Area. The following desired future condition and standards apply to this area. This area is occupied habitat for the Mexican spotted owl (Endangered Species Act Threatened), Gila trout (Endangered Species Act threatened) and for the Verde Rim springsnail (Forest Service sensitive).

Desired Condition for the Grapevine Botanical Area (DC-CK-MA-3, Forest Plan, page 104)

The area in and around the Grapevine Botanical Area provides a non-motorized setting for recreation. Within the Grapevine Botanical Area, Grapevine Creek and riparian areas are healthy, the watershed is properly functioning, and sensitive plant and animal species are protected. The unique botanical characteristics that make the area valuable for scientific research are protected and maintained.

Guide-WL-1: Habitat management objectives and terrestrial species protection measures from approved recovery plans should be applied to activities and special uses occurring within federally listed species habitat.

Guide-WL-2:

- Design features and mitigation measures should be incorporated in all Forest Service projects as needed to ensure that Southwestern Region Sensitive Species do not trend toward listing as threatened or endangered species.
- Design features and mitigation measures should be incorporated in all Forest Service projects as needed to ensure compliance with other Federal laws governing wildlife such as, but not limited to, Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act.

Guide-WL-4: For cavity nesting birds, snags should be retained at levels indicated in PNVT desired condition statements, if available, and replaced at natural recruitment rates.

Guide-WL-5: For raptors as each nest site (e.g., stick nest, cliff, ledge, cavity) is identified:

- Size and structure of raptor species' nest stands should be maintained.
- Disturbance at nest sites during the breeding season should be minimized.

Guide-WL-8: Projects should be designed to minimize the long-term impacts to wildlife from human activities in or adjacent to animal movement corridors.

Other Guidance or Recommendations

Mexican Spotted Owl Recovery Plan, First Revision (Strix occidentalis lucida) (USDI USFWS 2012)

A protected activity center is a minimum 600-acre area established around an owl nest (or sometimes roost) site for the purpose of protecting that area. The nest/roost core area within a protected activity center is a 100-acre area designed to offer additional protection to the nest or primary roost areas. Recovery habitat includes areas that either currently are or have the potential to become nesting and roosting habitat or does or could provide foraging, dispersal, or wintering habitats for a recovering owl population.

Desired Conditions

Desired conditions for Mexican spotted owl nesting and roosting habitat in protected activity centers and minimum desired conditions for recovery habitat managed for nesting and roosting habitat, shown in Tables C.2 and C.3, respectively, of the Recovery Plan (USDI USFWS 2012, page 275–278).

Management Recommendations

The intent is for the Prescott NF to meet the management recommendations when and where they are compatible with the purpose and need for the project. While all of the management recommendations would be met in different places or parts of the project, there will be instances where some will not be met. One example is in the construction of fuelbreaks where some key habitat variables would be removed such as snags, hardwoods, or down woody debris in order to create effective fuel breaks.

Protected Activity Centers

1. All activities within protected activity centers should be coordinated with the appropriate USDI USFWS office.
2. No mechanical or prescribed fire treatments should occur within protected activity centers during the breeding season unless non-breeding is inferred or confirmed that year per the accepted protocol.
3. Removal of hardwoods, downed woody debris, snags, and other key habitat variables should occur only when compatible with owl habitat management objectives as documented through reasoned analysis.
4. Road or trail maintenance, repair, and building in protected activity centers should be undertaken during the non-breeding season (1 September–28 February) to minimize disturbance to owls unless non-breeding is inferred or confirmed that year per the accepted survey protocol. The USDI USFWS recommends that no new roads or construction occur in protected activity centers.
5. Within all protected activity centers, light burning of surface and low-lying fuels may be allowed following careful review by biologists and fuel-management specialists. Generally, burns should be done during the non-breeding season (1 September–28 February) unless non-breeding is inferred or confirmed that year per the accepted survey protocol.
6. In some situations, prescribed fire alone may be insufficient to reduce fuels and protect protected activity centers. Mechanical treatments used singly or in combination with prescribe fire may be needed to reduce fire risk to owl nest/roost habitats and may enhance owl habitat. As a general guide, forest management programs in protected activity centers should be structured according to page 284 of the recovery plan.

Nest/Roost Core Areas in Protected Activity Centers

7. All activities within protected activity centers should be coordinated with the appropriate USDI USFWS office.
8. Management activities should be deferred from the nest/roost core during the breeding season (1 March–31 August), except where non-breeding is confirmed or inferred that year per the accepted survey protocol.
9. Planned ignitions (prescribed fire) and unplanned ignitions (wildland fire) should be allowed to enter cores only if they are expected to burn with low fire severity and intensity. Fire lines, check-lines, backfiring, and similar fire management tactics can be used to reduce fire effects and to maintain key habitat elements (e.g., hardwoods, large downed logs, snags, and large trees).
10. Other activities should be conducted outside of the breeding season unless pressing reasons dictate otherwise. These activities include road repair, removal of hazard trees, etc.

Recovery Habitat

11. **Reference Conditions:** *Nesting and Roosting Conditions in Forested Environments:* Reference conditions for management in forested recovery habitat are based on current knowledge of forests used by spotted owls and typically include relatively high tree basal area, large trees, multi-storied canopy, multi-aged trees, high canopy cover, and decadence in the form of downed logs and snags. Many stands also contain a prominent hardwood component. Tree basal area and large tree (greater than 46 centimeters [18 inches] diameter at breast height [dbh]) density are used to describe minimum conditions for owl nesting/roosting habitat (recovery plan, Table C.3). It is assumed that adequate amounts of canopy cover, snags, and downed logs either exist already or will develop over time when tree basal area and density approach the levels given in Table C.3.
12. **Recovery Habitat Guidelines for Forest Habitats:** *General Approach:* There are two types of stands with respect to desired nest/roost conditions: those that meet or exceed the conditions and those that do not. The overriding goal is to manage a specified portion of the landscape (recovery plan, Table C.3) as recovery nest/roost habitat; managers should identify and protect stands that meet or exceed nest/roost conditions and then assess whether or not these stands satisfy the area requirements in Table C.3. If these stands are not sufficient to meet the area requirements in Table C.3, managers should identify those stands in the planning area that come closest to meeting nest/roost conditions and manage those stands to develop nest/roost conditions as rapidly as reasonably possible to meet recommended percentages. Prescriptions may include thinning to promote growth of large trees. Stands that do not meet nest/roost conditions and are not designated for development of such can be managed to meet other resource objectives.
13. **Guidelines for Forested Recovery Habitat Managed as Nest/Roost Habitat:** Treatments are allowed within recovery habitat stands identified as meeting nest/roost conditions, as long as stand conditions remain at or above the values given in recovery plan Table C.3. Management activities that influence the owl and its habitat should be conducted according to guidelines on page 267 of the recovery plan.
14. **Guidelines for Forested Recovery Foraging/Non-breeding Habitat:** The intent is to manage recovery habitat so that important but difficult-to-replace habitat elements are conserved while allowing management flexibility. Management should strive to maintain conditions where multiple components occur in proximity to one another according to the guidelines on page 269 of the recovery plan.

Prescott National Forest Biological and Conference Opinion–Prescott National Forest Land and Resource Management Plan (USDI USFWS 2014)

Mexican Spotted Owl Terms and Conditions

1.1 The Prescott National Forest shall avoid activities within 0.25 mile of protected activity centers during the breeding season (March 1 to August 31) that could result in disturbance to nesting owls. If the Forest Service determines through protocol surveys that spotted owls are not nesting the year of the proposed project, then this restriction may not apply.

1.2 On site-specific projects, the Prescott National Forest will work with USDI USFWS staff to identify additional measures, specific to the project, to minimize effects to owls.

2.1 Forest Service management activities within protected activity centers and recovery habitat will maintain adequate amounts of important habitat features for owls (such as large trees, large snags, and large logs). The Prescott National Forest will work with the USDI USFWS during project-specific consultations to define "adequate" based upon site-specific conditions.

2.2 On site-specific projects, the Prescott National Forest will work with USDI USFWS staff to identify additional measures, specific to the project, to minimize effects to owls.

Topics and Issues Addressed in This Analysis

This report will address the purpose and need as well as the issue of treatments within Mexican spotted owl habitat, as described in the introduction.

Concerns about proposed vegetation treatments along Grapevine Creek with occupied habitat for Gila trout were brought up by the U.S. Fish and Wildlife Service and Arizona Game and Fish Department. Comments centered on maintaining adequate riparian/stream shade for water temperatures and mitigating treatments to reduce sedimentation effects to Grapevine Creek. These resource concerns are still relevant post-Goodwin Fire. The various resources protection measures identified for the proposed action still address these concerns and will be addressed in the analysis within this report.

Resource Indicators and Measures

Table 4 lists resource elements, indicators and measures for assessing effects as related to federally-listed species.

The Hassayampa Project proposes to reduce fuels and restore fire as an ecological process. Opportunities for treatments are proposed in a variety of potential natural vegetation types. Methods to be used to reduce fuels and create and maintain healthy and resilient ecosystems include hand thinning or pruning, prescribed burning, and mechanized and non-mechanized fuel reduction treatments. Roadwork and fire line construction would be conducted to support these activities. The proposed treatments could have potential impacts to Gila trout and their habitats in the project area. Project-related impacts of main concern to aquatic resources are sedimentation that can decrease aquatic habitat quality and quantity, and vegetation treatments in stream management zones that can affect water quality. The spatial scale to be

used for analysis is the upper Grapevine Creek watershed area and the stream management zone[3] that are related to aquatic resources.

Table 4. Resource indicators and measures for assessing effects

Resource Element	Resource Indicator	Measure	Used to Address: Purpose/Need, or Key Issue	Source (Forest Plan, Law or Policy, Best Management Practices, etc.)
Mexican Spotted Owl and its Habitat	Effects of treatments on protected activity center/core habitat	Retention and development of key habitat variables relative to desired conditions in Table C2 of the MSO Recovery Plan	Yes	Forest Plan; ESA (Mexican spotted owl Recovery Plan); MSO Critical Habitat Final Listing; FSM 2670; Forest Plan biological opinion; purpose and need; issues and public comment
	Effects of treatments on recovery habitat	Comparison of projected conditions to minimum desired conditions for nesting/roosting habitat in Table C3 of the MSO Recovery Plan	Yes	
		Impacts to foraging/dispersal habitat quality	Yes	
	Effects of actions on Mexican spotted owls	Predicted MSO responses to treatments	Yes	
MSO Critical Habitat	Effects of treatments on critical habitat primary constituent elements	Are PCEs providing forest structure and prey species habitat components?	Yes	
Aquatic habitat quantity and water quality	Sediment delivery	Total proposed vegetation treatments within upper Grapevine Creek watershed	No	State Water Quality Standards, Forest Plan
Aquatic/riparian habitat, water quality	Water temperature	Total proposed vegetation treatments within stream management zone of upper Grapevine Creek watershed	No	State Water Quality Standards, Forest Plan

Methodology

The best available scientific information and data were used to consider effects to Mexican spotted owl and Gila trout. These resources are listed in the references cited section and are filed in the project file.

[3] The streamside management zone (SMZ) is an area or strip of land adjacent to a stream or other body of water where management practices are planned and implemented in a manner that protects water quality, aquatic wildlife and wildlife habitat. Trees and vegetation within the streamside management zone serve as a natural filter to keep sediment out of a stream, reduce soil erosion, and buffer the stream from damage caused by nearby management activities such as harvesting of timber, vegetation treatment, and road construction or prescribed burning. The streamside management zone is not a zone of exclusion where all activities are precluded, but because of the need to protect water quality and other values, the zone is an area where activities should be carefully managed.

Some of the most significant ones are noted below as information sources. Standard Mexican spotted owl protected activity center monitoring was conducted. Recovery habitat was surveyed in 2011 and 2012 with no new owls detected (USFS 2011, 2012). No field surveys have been done recently to look for MSO outside of existing PACs. Suitable areas of recovery habitat will be surveyed in the future. Replacement nest/roost habitat has been identified within the recovery habitat (Map. 45).

The Forest Vegetation Simulator was used for Mexican spotted owl analyses. Forest Vegetation Simulator (FVS) is a simulation model used for predicting forest stand dynamics used extensively in the Forest Service and it has been used extensively to summarize current stand conditions and predict future stand conditions under various management alternatives (Dixon 2002, revised 2009). No action and proposed action model runs, as well as conditions and proposed treatments, are located in the project file.

Models approximate reality and therefore fail to reflect reality perfectly (Stratton 2006). The use of models such as FVS depends on sample data, validity of the model itself, and assumptions made by the modeler. All three affect the results. The use of FVS in this analysis is to generally characterize and display existing conditions and the nature and magnitude of treatment effects to support decisions to be made. The modeling results are not to be taken as reality, although effort is taken during the modeling exercise to make the exercise reflect reality. The mortality to trees from prescribed fire was found to be higher in the model than is actually experienced by Prescott NF personnel. This variable affected some of the modelling results such that values are not accurately representing anticipated effects.

The analysis of effects to aquatic species and their habitat evaluates direct, indirect, and cumulative effects for the proposed action alternative. Analysis is based on the aquatic resource measures related to the total amount of proposed vegetation treatments in upper Grapevine Creek watershed and also within the stream management zone in the project area. Existing conditions and effects analysis from the Soils and Hydrology reports (available in the project record) were reviewed to help quantify effects to aquatic resources. An important consideration to potential effects is the erosion hazard of potential natural vegetation types in the project area watershed.

Resource protection measures, including best management practices, site-specific mitigations, and Forest Plan standards and guidelines are incorporated into the development of the proposed action. By incorporating these resource protection measures and best management practices, it is believed that substantial conflicts with soil and hydrologic resources would be avoided, and potential impacts would be either eliminated or mitigated so that effects are within acceptable levels.

Information Sources

The following sources of information were largely used to support the analysis:

- Hassayampa Landscape Assessment (USDA Forest Service 2011b)
- Hassayampa Landscape Restoration Project Silviculture Report (USDA Forest Service 2017a)
- Final Environmental Impact Statement for the Prescott National Forest Land and Resource Management Plan, volume 1, Yavapai and Coconino Counties, Arizona. Forest Service Southwestern Region (USDA Forest Service 2015a)
- Land and Resource Management Plan for the Prescott National Forest, Yavapai and Coconino Counties Arizona (USDA Forest Service 2015b)
- Mexican Spotted Owl Monitoring (USDA Forest Service 2017b)
- 2005 ERI MSO Habitat Pre-settlement assessment

- Rapid Assessment Report for Selected Mexican Spotted Owl Habitat (USDA Forest Service 2015c)
- Recovery Plan for the Mexican Spotted Owl, First Revision (USDI USFWS 2012)
- Wildlife-specific layers contained in the Hassayampa Project geodatabase
- Conservation Assessment and Strategy for the Bald Eagle in Arizona (Driscoll et al. 2006)
- Effects of the proposed action to aquatic resources in the project area is taken from various published sources on fire effects and fuels management (Carter and Rinne 2005; Elliot et al. 2010; Gresswell 1999; Parker 2006; Pilliod et al. 2003; Rinne 1996). In addition, information on the existing watershed and soil conditions and the potential effects to these resources from the alternatives was taken from the Hydrology report (Hermandorfer 2017) and Soils report (Burgoyne 2017).

Additional sources are found in individual sections and in the references cited section.

Incomplete and Unavailable Information

Mexican spotted owl nest stands were not specifically sampled or modeled. However, select MSO PAC's and Core areas were sampled as part of the broader vegetation assessment. The data collected provided general habitat conditions to assess existing conditions and subsequently potential impacts to MSO, their habitats, and their use of the habitat for analysis purposes.

Only general information on aquatic resources within the upper Grapevine Creek area are available such as watershed area and ownership, perennial stream miles, aquatic species surveys, and water quality data. Stream habitat inventories have not been completed within the area. There are some limited riparian assessments for the project area.

Spatial and Temporal Context for Effects Analysis

Direct/Indirect Effects Boundaries

The spatial boundary for analyzing the short term direct and indirect effects to terrestrial wildlife species under consideration is essentially the 246,434-acre project boundary plus the remainder of the four partial or adjacent MSO PACs (Snowdrift, Highland, Payoff and Tritle) with portions in the project area. The temporal boundary for analyzing the long term direct and indirect effects is 20 years after initial treatment. This is the interval that most closely corresponds to the efficacy of the primary silvicultural treatments (project Silviculture report).

The spatial boundaries for analyzing the direct and indirect effects to Gila trout is the upper Grapevine Creek watershed within the 1-mile perennial stream segments, because it provides suitable and/or occupied habitat for aquatic species addressed in this report. The temporal boundaries for analyzing the direct and indirect effects are 1-5 years for short-term effects from vegetation treatments (both hand thinning and prescribed fire), and greater than 5 years for long-term effects, because of watershed response to treatments in the project area.

Cumulative Effects Boundaries

"Cumulative effects" are defined in the Final ESA Section 7 Consultation Handbook as the "the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered."

The most notable non-federal projects occurring within or adjacent to MSO habitat within the project area is the proliferation of homes being built on private inholdings throughout the project area. These projects are both modifying and eliminating possibly existing MSO habitat. These projects occurring adjacent to NFS lands may also be influencing MSO use of NFS lands.

The actual existing habitat conditions and MSO use of these adjacent private parcels is unknown. MSO occupancy monitoring has only been done on NFS lands.

The spatial boundaries for analyzing the cumulative effects to Gila trout is the upper Grapevine Creek watershed area, because of potential effects to suitable and/or occupied habitat. The entirety of this area is within forestland ownership, therefore no cumulative effects are present.

The spatial boundaries for analyzing the cumulative effects on vegetative conditions is the greater project area boundary and adjacent PACs as noted above. The size of this area includes sufficient area to perform landscape-level analysis, which more effectively captures the complete picture of vegetative and habitat conditions at the landscape level, as well as mid-scale habitat conditions, specific to species such as Mexican spotted owl.

The temporal boundary for analyzing the cumulative effects to wildlife is 20-years following the decision date because this will capture the impacts of the proposed activities.

Physical Environment (General Terrestrial Wildlife Habitat Features)

Existing Condition

The project area is approximately 234,515 acres of National Forest System lands, mainly south of and surrounding Prescott, Arizona (Map 1). The Bradshaw Ranger District is responsible for the management of these lands, which are all located within Yavapai County. The terrain encompassed by the analysis area is quite varied with respect to slope, aspect, and elevation. All ranges of aspects are represented in a distinctly hilly landscape. The elevation ranges from 7,979 feet atop Mount Union on the northern boundary of the project analysis area to approximately 3,200 feet near the town of Cleator.

Vegetation

Potential natural vegetation types (PNVTs) found within the proposed project area include Semi-Desert Grasslands, Juniper Grasslands, Piñon-Juniper Evergreen Shrub, Interior Chaparral, Ponderosa Pine-Evergreen Oak, Ponderosa Pine-Gamble Oak, Desert Communities, and Riparian Gallery Forest. Types and amount of PNVTs within the project area are displayed in Table 5.

Table 5. Potential natural vegetation types (PNVTs) within the Hassayampa Project area, including non-National Forest System lands		
Vegetation Type	**Acres**	**Percent of Project Area**
Semi-Desert Grassland	39,047	15.8
Juniper Grassland	10,690	4.3
Piñon-Juniper Evergreen Shrub	24,338	9.9
Interior Chaparral	140,100	56.9
Ponderosa Pine–Evergreen Oak	11,363	4.6
Ponderosa Pine–Gambel Oak[1]	17,425	7.1
Desert Communities	246	0.1
Riparian Gallery Forest	3,224	1.3
Total	**246,434**	**100**

[1] Includes dry Mixed-Conifer with Frequent Fire PNVT because they are described by the same vegetation structure and disturbance regimes (Forest Plan, page 36).

Historically, fire was an integral process for keeping fire-adapted ecosystems healthy, diverse, and resilient to disturbance. Decades of fire suppression, along with other management activities, have disrupted the natural fire disturbance regime, which resulted in plant communities that are overgrown, which makes them susceptible to insects and disease as well as stress from drought and climate change.

Since 2005, approximately 76,000 acres have burned within the project area. Most recently, the Goodwin Fire, which started on June 24, 2017, burned 25,648 acres of National Forest System lands within the project area; an additional 2,868 acres burned on other land ownerships outside the Forest boundary. The majority (78 percent) of the entire burn area is Interior Chaparral. The remaining 22 percent consists of six other PNVTs, as shown in Table 6.

Table 6. Potential natural vegetation types within the Goodwin Fire Perimeter		
PNVT	**Acres**	**Percent of Fire Area**
Interior Chaparral	22,457	78
Ponderosa Pine-Gambel Oak (Includes dry mixed conifer)	3,651	13
Semi-Desert Grassland	874	3
Juniper Grassland	507	2
Ponderosa Pine-Evergreen Oak	421	2
Piñon-Juniper Evergreen Shrub	362	1
Riparian Gallery	244	1
Total	**28,516**	**100**

The fire intensity for each PNVT within the fire perimeter is displayed in Table 7. Within the two predominant PNVTs, Interior Chaparral and Ponderosa Pine-Gamble Oak, the burn intensity follows the historical fire regime for the PNVT.

Table 7. Burn severity by potential natural vegetation within the Goodwin Fire Perimeter				
PNVT	Unburned Acres	Low Severity Acres	Medium Severity Acres	High Severity Acres
Interior Chaparral	709	1,644	13,026	7,079
Ponderosa Pine-Gambel Oak	1,059	1,530	944	118
Semi-Desert Grassland	599	190	83	2
Juniper Grassland	121	118	202	66
Ponderosa Pine-Evergreen Oak	29	106	230	57
Piñon-Juniper Evergreen Shrub	4	46	263	49
Riparian Gallery	81	74	80	9
Total	**2,602**	**3,708**	**14,828**	**7,379**

Interior chaparral is well-adapted to fire and prolifically reproduces from heat scarified seed or sprouts vigorously from enlarged root crowns. Chaparral is in a constant state of transition from young to older stages and back again, with fire being the major disturbance factor. These areas historically have a high severity fire regime occurring with a frequency of 35 to 100 years, achieving closed-canopy conditions 6 to 7 years post fire (Brown 1994). In the Goodwin Fire, over 90 percent of the Interior Chaparral PNVT burned with a medium or high burn intensity, which matches historic fire regime.

In contrast, the Ponderosa Pine-Gamble Oak type burns frequently (every 1 to 15 years) at low intensities. These fires keep the forest open with abundant herbaceous cover. Within the Goodwin Fire perimeter, 71 percent of the Ponderosa Pine-Gamble Oak type was either unburned or experienced low-severity fire, which is consistent with the historic fire regime.

The inclusions of dry mixed conifer stands within the ponderosa PNVT reflect slight variations in moisture and temperature on the landscape as a result of aspect and elevation. Due to the juxtaposition of these stands within the surrounding ponderosa pine forest vegetation, it is likely that these stands experienced similar fire disturbance regimes. This is supported by the evidence collected within two of the MSO PACs within the project area. Fire scar samples from Venezia and Knapp Gulch (aka Snowdrift) MSO PAC habitat show fire return intervals of this same (1-15 years) frequency (ERI 2005). The lack of fire since the late 1800's has had a detrimental impact on the structure, composition, and spatial patterns of these stands. As is reflected in the current conditions, the species composition has shifted toward more shade-tolerant, less fire-resistant species. The Snowdrift MSO PAC currently contains 40% dry mixed conifer. The combination of fire exclusion, grazing, selective logging, and favorable climatic conditions for young tree establishment in the early 20th century has created atypical stand compositions and structures in many of today's dry mixed conifer forests (Moore and others 2004 in GTR 310).

A relatively frequent fire regime would have had similar effects to the dry mixed conifer sites resulting in fine-scale structure and spatial patterns similar to those of ponderosa pine with more open structure and similar aggregated arrangement of trees in some stands (GTR 310, pg 26). Empirical evidence also indicates that historical dry mixed-conifer forests had lower tree densities and a more open structure comprised of a higher proportion of old and large trees, were more spatially heterogeneous (having groups and patches of trees) and were more uneven-aged than current conditions (GTR 310). The existing dense conditions reflect a high degree of the departure from historical compositions, structures and spatial patterns as a result of a severe disruption of the characteristic fire regime (Fulé and others 2002 in GTR 310).

For the remaining portion of the project area (217,918 acres), the forest vegetation specialist assessed the existing conditions of plant communities in the project area and found they consist of mature chaparral that is uniformly dense and forested stands that lack diversity at all scales. The dense, overstocked trees are crowded and competing for limited space, nutrients, and water. The result is smaller diameter trees with lifted crowns and less than optimal vigor to resist insect, disease, and drought stresses. The thick carpet of trees drops more needles each year creating an impermeable mat of dead needles on the forest floor. The contiguous dense canopy blocks sunlight and water from reaching the forest floor. This all contributes to little or no grasses, forbs, or shrubs occurring in the understory of the forested stands.

Over-mature chaparral is dense, thick, and unpalatable for ungulates and other wildlife species. It blocks sunlight and water from reaching the soil underneath. Structurally, the older chaparral contains large volumes of dead branches that can burn intensely during fires and scorch nearby trees and sometimes the soil. Large blocks of over-mature chaparral provide little habitat diversity for all types of wildlife, including insects, mammals, and birds.

While the overall desired conditions from the Prescott National Forest Land and Resource Management Plan (Forest Plan; USDA Forest Service 2015b) were presented previously, Table 8 compares the existing conditions with the site specific desired conditions.

Table 8. Hassayampa Project area existing and desired conditions by potential natural vegetation type at the landscape scale		
Measure	**Existing Condition**	**Project Specific Desired Conditions**
Semi-Desert Grassland	➢ Lack of desired fire disturbance; tree and shrub encroachment; increases in exposed soil surface and spread of nonnative plants. Low similarity to vegetation structure and fire disturbance desired conditions.	➢ Perennial herbaceous species dominate and include native grasses, sedges, rushes, and forbs and, where appropriate, a diversity of shrubs. ➢ Woody canopy cover is less than 10 percent. ➢ Composition, structure, and cover provide habitat for native animals associated with grasslands, especially pronghorn antelope, ferruginous and Swainson's hawks, western burrowing owls, and western grasshopper sparrows. ➢ On average, fine fuels provide for and maintain the desired fire regime with desired fire return interval approximately every 10 to 15 years.
Juniper Grassland	➢ Lack of desired fire disturbance; increased tree and shrub density and canopy cover; lack of perennial grasses and forbs. Moderate similarity to vegetation structure and fire disturbance desired conditions.	➢ Generally uneven-aged and open in appearance. ➢ Trees occur as individuals or in smaller groups. ➢ Tree canopy cover ranges 5 to 30 percent. A continuous herbaceous understory, including native grasses and forbs, are present, with incidental occurrence of shrubs that support a natural fire regime. ➢ Old growth occurs throughout the landscape, as individual trees or as clumps. Old growth components include old trees, snags, coarse woody debris, and structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance. ➢ Snags are scattered across the landscape. ➢ Fires occur every 1 to 35 years with low severity favoring regrowth and germination of native grasses and forbs.

Table 8. Hassayampa Project area existing and desired conditions by potential natural vegetation type at the landscape scale		
Measure	**Existing Condition**	**Project Specific Desired Conditions**
Piñon-Juniper Evergreen Shrub	➢ Mid-aged Utah and one-seed juniper and scattered piñon pine occur in the overstory. The understory vegetation consists of turbinella oak, manzanita and other chaparral species with few grasses or forbs. The site has exposed soils and very little herbaceous cover. Low similarity to vegetation structure and moderate similarity to fire disturbance desired conditions.	➢ A mix of trees and shrubs and herbaceous vegetation occurring on the landscape as discrete tree groups and shrub patches. ➢ Typically, there is a mosaic of groups of trees that are even-aged in structure with all ages represented across the landscape. ➢ The understory is dominated by low to moderate density shrubs with shrub canopy cover 10 to 65 percent. ➢ Native perennial grasses and annual and perennial forbs are present in the interspaces. ➢ Old growth occurs throughout the landscape, as individual trees or as clumps. Old growth components include old trees, snags, coarse woody debris, and structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance. ➢ Snags are scattered across the landscape. ➢ Fires are typically of mixed severity while some evergreen shrub types exhibit occasional high severity fires. Regardless of the level of severity, fires occur with an average frequency of 35 to 100 years.
Interior Chaparral	➢ Over-mature chaparral is dense, thick, and unpalatable for ungulates and other wildlife species. It blocks sunlight and water from reaching the soil underneath. Structurally, the older chaparral contains large volumes of dead branches that can burn intensely during fires and scorch nearby trees and sometimes the soil. Large blocks of over-mature chaparral provide little habitat diversity for all types of wildlife, including insects, mammals, and birds.	➢ Contains a grassland forb component in the understory during the young stages of development. The mid-to-late development stages are dense thickets with considerable shrub litter. ➢ Standing dead material may accumulate in areas that have not burned for several decades. Ground cover consists primarily of shrub litter. ➢ Greater than 70 percent of chaparral is closed canopy with some openings of grasses and forbs. ➢ Chaparral is in a constant state of transition from young to older stages and back again, with fire being the major disturbance factor. High severity fires occur with a frequency of once every 35 to 100 years.

Table 8. Hassayampa Project area existing and desired conditions by potential natural vegetation type at the landscape scale		
Measure	**Existing Condition**	**Project Specific Desired Conditions**
Ponderosa Pine–Evergreen Oak	➢ Predominantly even-aged, somewhat densely stocked, lacking vertical and horizontal heterogeneity ➢ Lacking age-class diversity ➢ Old forest components are generally absent or poorly represented. ➢ In the Ponderosa Pine PNVTs, there is a great overabundance, relative to desired conditions, of stands characterized by pole or medium and larger sawtimber with closed canopies; and correspondingly, a great under-abundance of the same kinds of stands with open canopies.	**For all areas:** ➢ Diverse stand structures that allow fire to occur naturally on the landscape and are resilient to endemic levels of insects and diseases ➢ Healthy stands of trees with all ages classes represented ➢ Diversity of tree, shrub, and herbaceous species ➢ 40-80 BA in PIPO **For WUI:** ➢ Vegetation structure in fuel breaks that is conducive to low intensity fire behavior adjacent to private land **For Goshawk habitat:** ➢ Post-fledging family areas – 10-20% higher than surrounding forest ➢ Nest stands – multi-aged forest dominated by large trees with dense canopies **In MSO Habitat:** ➢ In MSO PAC habitat in Pine/oak habitat, BA range from 90-130 within core and 60-110 outside the core ➢ MSO PAC habitat - maintain high canopy cover with the BA in larger diameter trees. ➢ Vertical and horizontal heterogeneity in stand structure across the landscape ➢ Diversity of patch sizes (2.5 acres and up) with heterogeneity between patches ➢ Horizontal and vertical habitat heterogeneity within patches ➢ Trees species diversity including hardwoods such as Emory oak and Arizona white oak ➢ Diverse composition of native herbaceous and shrub species ➢ Openings (0.1-2.5 acres) provide small canopy gaps within forested patches ➢ Diversity of trees sizes including large trees >16”dbh

Table 8. Hassayampa Project area existing and desired conditions by potential natural vegetation type at the landscape scale		
Measure	**Existing Condition**	**Project Specific Desired Conditions**
Ponderosa Pine–Gambel Oak	➢ Predominantly even-aged, somewhat densely stocked, vertically simple with some exceptions, and lacking horizontal pattern diversity due to somewhat unbroken age-classes between stands. ➢ Old forest components are generally absent or poorly represented. ➢ In the Ponderosa Pine PNVTs, there is a great overabundance, relative to desired conditions, of stands characterized by pole or medium and larger sawtimber with closed canopies; and correspondingly, a great under-abundance of the same kinds of stands with open canopies. ➢ On the higher-productivity pine sites in particular, those supporting Gambel oak or moister-site conifers such as Douglas-fir or white fir in association with pine, such conditions are considered outside the range of historic conditions. Low similarity to vegetation structure and fire disturbance desired conditions. ➢ Landscape lacks horizontal and vertical heterogeneity within and between stands ➢ Lack of openings in forested stands ➢ Lack of diversity in herbaceous and shrub species due to dense canopies and lack of openings ➢ Some areas lack large trees due to density of medium-sized trees	**For all areas:** ➢ Diverse stand structures that allow fire to occur naturally on the landscape and are resilient to endemic levels of insects and diseases ➢ Healthy stands of trees with all ages classes represented ➢ Diversity of tree, shrub, and herbaceous species ➢ 40-80 BA in PIPO **For WUI:** ➢ Vegetation structure in fuel breaks that is conducive to low intensity fire behavior adjacent to private land **For Goshawk habitat:** ➢ Post-fledging family areas – 10-20% higher than surrounding forest ➢ Nest stands – multi-aged forest dominated by large trees with dense canopies **In MSO Habitat:** ➢ In MSO PAC habitat in Pine/oak habitat, BA range from 90-130 within core and 60-110 outside the core ➢ In MSO PAC habitat in dry mixed conifer habitat, BA ranges 100-140 in PAC and 110-150 in core ➢ MSO PAC habitat - maintain high canopy cover with the BA in larger diameter trees. ➢ In dry mixed conifer Recovery habitat 80-120 BA ➢ Vertical and horizontal heterogeneity in stand structure across the landscape ➢ Diversity of patch sizes (2.5 acres and up) with heterogeneity between patches ➢ Horizontal and vertical habitat heterogeneity within patches ➢ Trees species diversity including hardwoods and shade-tolerant species ➢ Diverse composition of native herbaceous and shrub species ➢ Openings (0.1-2.5 acres) provide small canopy gaps within forested patches ➢ Diversity of trees sizes including large trees >16”dbh

Table 8. Hassayampa Project area existing and desired conditions by potential natural vegetation type at the landscape scale		
Measure	**Existing Condition**	**Project Specific Desired Conditions**
Riparian Gallery Forest	➢ High similarity to vegetation structure and fire disturbance desired conditions.	➢ Compared to surrounding uplands, riparian corridors have characteristics that reduce the frequency and severity of fire. ➢ Infrequent fires of high severity and occasionally mixed severity, occur every 600 years. ➢ Native species of vegetation support a range of invertebrate and vertebrate species and are free of invasive plant and animal species.

The expectation is that future site-specific projects will produce a trend toward the desired conditions that are described for each of the PNVTs. Wildlife and plant species are often associated with a PNVT. As conditions trend toward those that are desired, it is intended that habitat for associated species will improve as well.

Endangered Species Act Terrestrial Species and Habitats

Table 9 compares the known habitat and distribution for each species with the project area and proposed action.

Table 9. Federally listed terrestrial species and habitats under the Endangered Species Act			
Species: **Common name** ***Scientific Name***	**Status [1]**	**Known Distribution or Habitat Association for the Species**	**Project Information** **Project Area Is in Various Vegetation Types, 3,200 to 7,979 Feet, Largely in the Hassayampa Basin**
Birds			
Mexican Spotted Owl *Strix occidentalis lucida*	T	The Mexican spotted owl is known to nest in high elevation ponderosa pine/Gambel oak and dry mixed conifer and canyon lands.	Mexican spotted owl occurs within the project area (Map 2).
Mexican spotted Owl Critical Habitat	----	Designated on the Bradshaw Ranger District of the Prescott National Forest in the Prescott Basin and Crown King areas.	Critical habitat for the Mexican spotted owl occurs within the project area (Map 3).

[1] E = Listed Endangered under the ESA (any species that is in danger of extinction throughout all or a significant portion of its range). T = Listed Threatened under the ESA (any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range). Proposed = Proposed threatened under the ESA. See appendix A for more details.

Mexican Spotted Owl

Species Ecology

The Mexican spotted owl was listed as threatened in 1993 (58 *Federal Register* 14248) and a recovery plan was issued in 1995. The recovery plan was revised in 2012 (USDI USFWS 2012). Species taxonomy, description, distribution, habitat use, prey ecology, population ecology, population trends, critical habitat, threats, and management recommendations can be found in the revised Mexican Spotted Owl Recovery Plan (recovery plan; USDI USFWS 2012).

The recovery plan includes several changes since the publication of the 1995 recovery plan, the following of which are of particular significance to the Hassayampa Landscape Restoration Project.

- The primary threat to Mexican spotted owl in the U.S. has transitioned from timber harvest to an increased risk of stand-replacing wildland fire. Recent forest management now emphasizes sustainable ecological function and a return toward pre-settlement fire regimes, both of which are more compatible with maintenance of spotted owl habitat conditions than the even-aged management regime practiced at the time of listing. "Conversely, southwestern forests have experienced larger and more severe wildland fires from 1995 to the present than previous to 1995 that could result in even larger and more severe wildland fires in owl habitat" (page VI).

- The MSO Recovery Plan identifies activities that can be conducted inside of protected activity centers and further specifies activities to occur within and outside of nest/roost core areas. The Recovery Plan states that up to 20 percent of the total protected activity center acres within an ecological management unit could be mechanically treated to reduce fire risk to owl nest/roost habitats and enhance owl habitat before we needed to stop and evaluate monitoring to determine the effects to the species and its habitat.

- Recommended management actions for core areas, protected activity centers, and recovery habitats, have been updated in Table C.1 (recovery plan, pages 274–275).

- Generalized description of key habitat variables comprising desired conditions for protected activity center and recovery habitat have been identified in Table C.2 (recovery plan, pages 275–277).

- Quantitative values for core recovery nesting/roosting habitat desired conditions are identified in Table C.3 (recovery plan, page 278).

Affected Environment

All of the MSO habitat on the Prescott National Forest lies within the Basin and Range West Ecological Management Unit (USDI USFWS 2012) and includes the western most known occupied habitat for the owl within the EMU. Mexican spotted owls occupy a wide range of habitat types within the Basin and Range West Ecological Management Unit. The majority of owls occur in isolated mountain ranges where they inhabit encinal oak woodlands; dry mixed-conifer, pine-oak, riparian forests; and, rocky canyons (USDI USFWS 2012), although rocky canyon habitat is not present within the Hassayampa Project area. Federal lands encompass 40 percent of this ecological management unit and recreation use is the predominant land use. High severity fire is a recognized threat to the MSO within this EMU.

Seventeen protected activity centers have been designated for Mexican spotted owls within the Prescott National Forest. Fifteen of the 17 protected activity centers on the Forest occur on the Bradshaw Ranger

District while the other two occur on Mingus Mountain of the Verde Ranger District. Twelve protected activity centers are analyzed in this project (Map 2). Eight PACs are either completely or mostly within the project boundary: Big Bug, Grapevine, Palace, Venezia, Silver Spruce, Mtn Pine Acres, Towers, and Lorena (Maps 4, 7, 10, 13, 16, 19, 25, & 28, respectively). Four PACs have only a small portion of the PAC within the project area: Snowdrift, Highland Pines, Tritle, and Payoff (Maps 22, 31, 34, & 37 respectively).

Recovery habitat (Map 45) includes suitable habitat outside of protected activity centers managed as nest/roost replacement (25% of mixed conifer recovery habitat and 10% of pine-oak recovery habitat), foraging, dispersal, and wintering habitat. Recovery habitat includes pine-oak, dry mixed-conifer, and riparian forests well as rocky canyons (USDI USFWS 2012).

Monitoring Results

All 12 protected activity centers within the project area, with the exception of the recently (2014) designated Grapevine Protected Activity Center, have been monitored since 1990, with a lapse in monitoring in 2006, 2007, and 2010. Table 10 shows the monitoring results of each protected activity center.

Table 10. Cumulative monitoring for Mexican spotted owl protected activity centers within the Hassayampa Project area												
	Palace Station	**Venezia**	**Silver Spruce**	**Mt. Pine Acres**	**Big Bug**	**Grapevine**	**Towers**	**Highland Pines**	**Payoff**	**Lorena Gulch**	**Snowdrift**	**Mt. Tritle**
1990	MU	MU	O, NU	MU	O, NU	NA	MU	O, 1Y	P, NU	O, NU	MU	MU
1991	O, 3Y	X, ADJ=M	M, NU	O, NN	NM		MU	O, NF	IM, NR	O, NU	X,Adj=O	MU
1992	O, NF; M/Sub	X, ADJ	M, NU	IM, O, NU	O, NU		NM (X)	O, 2Y	O, 1YD	O, NU	NM(X)	O, 1Y
1993	IM, O, 1Y	NM (X)	IM, NR	IM, O, NU	IM, NR		O, NU	F, NN	IM, M, NU	IM, O, NU	NM(X)	IM, O, NU
1994	IM, NR	X, ADJ	IM, O, NU	IM, O, NU	IM, O, NU		IM, NR	F, NU	IM, M, NU	IM, O, NU	NM(X)	IM, F, NU
1995	IM, M, NU	X, ADJ	IM, P, NU	O, NN	IM, P, NU		IM, O, NU	IM, NR	IM, M, NU	F, NN	NM(X)	IM, NR
1996	IM, M, NU	NM	IM, M, NU	O, NN	IM, P, NU		IM, O, NU	IM, NR	IM, F, NU	IM, F, NU	IM, O, NU	IM, P, NU
1997	NM	O, NU	NM	IM, F, NU	NM		NM	NM	NM	F, NN	A	NM
1998	IM, O, NN	IM, ADJ=O	NM	IM, O, NN	IM, O, 1Y		IM, F, NU	A	IM, NR	F, NN	M, NU	IM, O, NN
1999	IM, O, NU	IM, NR	IM, NR	IM, M, NU	NM		NM	NM	NM	F, NN	A	IM, O, 2Y
2000	O, 2Y	IM, NR	NM	NM	IM, NR		NM	IM, NR	NM	F, NN	F,NU	NM
2001	P, NU	A	NM	NM	NM		IM, NR	A	Adj-F	F, NN	A	O, NU
2002	A	A	A	P, NN	P, NU		A	A	Adj-F	F, NN	A	O, NU
2003	A	A	P, NU	O, NN	Sub = F, NN		A	Sub, NN	A	F, NN	A	P, NN
2004	A	IM, NR	P, NU	IM, NR	IM, NR		IM, F, NU	Sub, NN	IM, NR	F, NN	O, NN	O, NN
2005	A	A	NM	IM, P, NU	IM, NR		NM	A	NM	F, NN	P, NU	NM
2008	NM	A	NM	NM	NM		NM	NM	NM	NM	NM	NM
2009	NM	NM	NM	NM	NM		NM	A	NM	NM	NM	O,3Y
2011	NM	NM	NM	NM	NM		NM	A	NM	NM	NM	M

Table 10. Cumulative monitoring for Mexican spotted owl protected activity centers within the Hassayampa Project area												
	Palace Station	**Venezia**	**Silver Spruce**	**Mt. Pine Acres**	**Big Bug**	**Grapevine**	**Towers**	**Highland Pines**	**Payoff**	**Lorena Gulch**	**Snowdrift**	**Mt. Tritle**
2012	A	NM	NM	P	NM		NM	A	A	NM	A	O, 2Y
2013	NM	NM	NM	O	NM		NM	A	P	A	NM	O
2014	A	A	P	O, 2Y	A	NEW: M	A	O	O	A	A	O, 3Y
2015	A	A	O, 2Y	NM	A	O, 1Y	P	NM	O	NM	A	M
2016	A	A	NM	P	NM	P	NM	A	P	A	NM	A
2017	NM	NM	M	NM	A[1]	P[2]	O, 2Y	NM	NM	NM	A	NM
2018	NM	NM	P	P	NM	O, NN	NM	A	O, NN	NM	O, NN	P

[1] Three of four required visits for protocol were made before the area was closed to entry due to the Goodwin Fire.

[2] 1 visit made 5/4/17–daytime follow up 5/5/17; pair took four mice, ate three, cached one; survey not completed; within Goodwin Fire area closed to entry

Legend

Protected Activity Center Occupancy

NR= No response (informal/ partial monitoring)
A = Absent (formally monitored to protocol/4 visits)
O = Occupied by pair
P = Presence of a single owl, sex unknown
F = Single female owl
M = Single male owl
Sub = 1- or 2-year-old
ADJ = Detection of an Mexican spotted owl in this protected activity center that is primarily using an adjacent protected activity center/area

Breeding Status

Y = Number of young fledged
YD = Number of young found dead
NF = Nest failed or abandoned
NN = Not nesting
NU = Nesting status undetermined

Monitoring Status

NM = Not Monitored
X = Not established as a protected activity center at that time
IM = Informal/partial monitoring

2014 to 2018 Mexican Spotted Owl Monitoring

In order to remain current on Mexican spotted owl protected activity center monitoring for future potential management projects and their associated activities, and to have at least 2 years of consecutive surveys and one survey every other year for each protected activity center thereafter, the Prescott National Forest decided that in 2014 all 15 protected activity centers would be monitored per the USFWS survey protocol (USDI USFWS 2012). As such, the remaining protected activity centers not monitored in 2013 were scheduled and completed in 2015. Surveys in recovery habitat will be conducted as recommended in the MSO Recovery Plan to meet compliance for future projects located within suitable habitat.

In 2014, a single adult Mexican spotted owl in the Grapevine Botanical Area was independently reported in an area where no protected activity center was established. The nearest Mexican spotted owl protected activity center to this new sighting is Big Bug Protected Activity Center, approximately 1.5 miles northwest of Grapevine Creek. In 2015 and 2016, we conducted formal surveys in Grapevine to determine the status of Mexican spotted owl occupancy. As a result, an active pair with 1 young was confirmed in 2015 and a protected activity center was established for this Mexican spotted owl pair in 2016.

Monitoring surveys were conducted utilizing Prescott National Forest qualified personnel and scheduled during the breeding season March 1, 2016 through August 31, 2016. Mexican spotted owl protected activity centers are monitored/surveyed to protocol up to four times during the breeding season to determine presence and breeding activity. Once a Mexican spotted owl or pair was detected, a daytime follow-up visit should be conducted to locate the roost site and/or determine the Mexican spotted owls breeding activity.

In 2016 the Prescott National Forest conducted monitoring surveys for all known Mexican spotted owl protected activity centers located on public land. No recovery habitat areas outside of protected activity centers were surveyed in 2016. The monitoring of known Mexican spotted owl protected activity centers is done to determine presence, reproductive status and monitoring population trends in association with current and future management activities on the Prescott National Forest and to remain in compliance with the ESA, MSO Recovery Plan, and the Forest Plan biological opinion.

Mexican spotted owl surveys were completed for the Prescott National Forest in 2016 following the monitoring protocol in the recovery plan. One new (in 2015) and nine established protected activity centers were monitored for Mexican spotted owl presence and breeding activity. Mt. Tritle, Payoff and Venezia were only monitored once, Mtn. Pine Acres was monitored twice. Of those, Mt. Pine Acres resulted in a detected Mexican spotted owl presence. The narrative descriptions of those detections and determination of breeding activity are described in USDA Forest Service (2017b).

Most of the protected activity center habitat surveyed, with the exception of Palace Station, Venenzia, and Lorena Gulch, contained suitable Mexican spotted owl habitat in areas comprised of old forest stands of dry mixed-conifers with closed canopies, commonly with an understory of Gambel's oak (*Quercus gambelii*) (USDA Forest Service 2017b).

The two PACs discussed below are the most severely departed from desired conditions, for very different reasons.

Palace Station

Palace Station has changed dramatically. The habitat is of poor quality due to high bark beetle mortality in the 2002 to 2003 and many of the conifers have fallen over time leaving an open canopy which favors the growth of a brushy chaparral component. The August Fire in 2007 that occurred after the beetle kill removed the residual conifer overstory and created conditions favoring the Gambel oak understory.

Lorena Gulch

Lorena Gulch Protected Activity Center was affected by the Lane II (2008) and Gladiator (2012) wildfires respectively. The Lane II Fire had a high burn severity in 50 percent of the Mexican spotted owl protected and recovery habitat. The small drainage where the female Mexican spotted owl was last detected was not affected by the fire, but a substantial amount of the surrounding suitable habitat was lost in this protected activity center such that it may no longer function as an MSO nest/roost site.

Goodwin Fire Effects

The Grapevine Botanical Area was extensively impacted by the Goodwin Fire, with 51 percent of the area experiencing medium or high burn severity. There was minor overlap between the fire and the Big Bug Protected Activity Center, but the fire was within the historical fire regime at that location. The impact to Mexican spotted owl habitat was low (roughly the level of a light prescribed burn because the area was intentionally ignited as a burnout operation. Some of the ponderosa pine in the Grapevine Protected Activity Center burned at moderate to high severity, but the core burned at low severity.

Rapid Assessment Report for Selected Mexican Spotted Owl Habitat

Fire is a natural disturbance agent in southwestern forests, with which Mexican spotted owls have co-evolved (USDI USFWS 2012).

After more than 10 years of managing MSO habitat within the WUI surrounding Prescott, in 2005, the Prescott National Forest worked with the Northern Arizona University (NAU) Ecological Restoration Institute (ERI) to collect pre-settlement data and do a rapid assessment of the fire history within MSO PAC habitat. Based on fire scar evidence collected from within MSO PAC habitat, the rapid assessment showed that the historic fire frequency in MSO PAC habitat was 1-16 years (Tuten et al, 2006).

In 2015 the Prescott National Forest again commissioned the ERI to conduct a rapid assessment of the historical tree evidence within Mexican spotted owl habitats, including core, PAC, and restricted habitats (Sensibaugh and Greco, 2015) to gain a better perspective on the reference conditions for these sites. Mexican spotted owls are known to have strong site fidelity to their nesting stands and resource managers wanted to investigate how these sites may have changed over time.

Not surprisingly, the rapid assessment results showed that historical trees per acre were densest in the Mexican spotted owl protected activity center core, the 100 acres around a known nest or roost. These historic densities were much lower than the existing densities currently in these areas. Based on fire scar evidence, there was evidence that all of the Mexican spotted owl areas experienced frequent fire and that fire intensity was likely less in the cooler, shaded, mesic locations associated with the cores.

Historical conditions data indicate that the more mesic sites had scattered individual and small groups of interspersed Ponderosa Pine and Douglas fir with some scattered white fir. The dry mixed conifer stands were more open, and treeless interspaces were part of the landscape. While the north facing slopes and cooler, wetter drainages supported slightly higher stocking than south facing or dryer sites, the sites supported white fir and some aspen with Douglas fir while Ponderosa pine and Gambel Oak were still the most prominent species on the sites

Historic stands dominated by ponderosa pine with open canopies and openings with grasses, forbs and shrubs have shifted to stands with Douglas-fir and white fir with dense canopies, no openings, and a forest floor covered with a thick layer of needles with sparse, if any, ground vegetation. The report estimated that there are 10 to 100 times as many trees on the landscape as occurred in the historic frequent-fire regime. These conditions are conducive to insect and disease outbreaks of greater scale and intensity than would normally occur in a healthy forest. The risk of stand-replacing catastrophic fire is also greatly increased. A catastrophic fire would impact the Mexican spotted owl's habitat as well as the habitat (grasses and forbs) of its prey.

The Ecological Restoration Institute collected site-specific historical ecological tree data for the Prescott Owl Rapid Assessment area to establish site-specific tree reference conditions (forest conditions that were in place 140–150 years ago when frequent fire was still a dominant component of the ecological system). Reference conditions were collected in three different areas; owl protected activity centers, protected activity center cores, and within a 0.5 mile of the protected activity centers. ERI's analysis included six of the twelve protected activity centers in the Hassayampa Project area: Mt. Pine Acres, Mt. Tritle, Payoff, Silver Spruce, Snowdrift, and Venezia. The results were intended for use as a site specific frame of reference for forest restoration project design, particularly as it relates to Mexican spotted owl habitat.

The Ecological Restoration Institute placed 96 individual study plots within the project area. The entire plot data collection was completed through a "rapid assessment" process (described in appendix A of USDA Forest Service [2015c]). Plots were randomly selected, but were not placed in areas where there were no conifer trees because there was an interest in describing the natural range of variability in areas where trees occupied the landscape as opposed to looking at the natural range of variability across the entire landscape.

Current Stand Conditions

General Observations in Relation to Historic Evidence

Ponderosa pine, oak, juniper, and Douglas fir were the dominant tree species identified on the Prescott Owl Rapid Assessment area. Several minor species (such as white fir, box elder and aspen) are present in some stands in this area. All of the dominant tree species were encountered, but not all of these species were represented on all plots. These dominant tree species were also present historically, as multi-aged, small groups or individual trees, and evidences were located in all parts of the Prescott Owl Rapid Assessment area.

The common theme and most significant vegetative condition across the landscape in all vegetation types was the current tree density. Current stand densities are significantly higher than historic conditions cross the project area in both the ponderosa pine dominated sites as well as the dry mixed conifer sites.

These tree densities create increased fuel loading and hazard, as well as ecosystem health concerns and vulnerability to facilitate severe insect outbreaks and destructive, high-intensity crown fire. These conditions, if left untreated, will continue to degrade, ultimately resulting in a potentially undesirable consequence. Desired stand conditions generally have multiple-age classes in all species. With the disruption of the frequent fire regime, there is currently a greater number of smaller, younger trees across the landscape. In the dry mixed conifer stands there is a shift to more shade tolerant trees in the understory. Live, large and old ponderosa pine and Douglas-fir tree species within the Prescott Owl Rapid Assessment area are present, either in groups or individually placed. Older, larger oak and juniper trees were mostly found as individual trees.

Ponderosa Pine-Dominated Sites

In summary, current stand conditions were estimated to range from 150 to more than 1,500 trees per acre (TPA), with all diameter classes represented through multiple age cohorts. There are 10 to 100 times as many trees across the landscape than estimated were present in the historic, frequent-fire regime period. The age class diversity has shifted toward younger trees. In addition to a significantly higher density of trees, some study plots demonstrated a shift in the species composition, with increased shade tolerant species (mostly white fir), and Gamble oak and juniper species where historic tree thinning from frequent fire has not occurred for 140 to 150 years. Also, there has been a general encroachment into open areas (interspaces as well as grasslands and meadows) by tree species and an overall reduction in understory vegetation (grasses, forbs, and shrubs). Increased shading from dense regeneration within the project has reduced the amount of understory grass, forb and shrub layers that provide important food and hiding cover for wildlife, compared to what is known about historical conditions. Another effect of the high

density of trees, that was observed, is the presence of an average 1 to 2-inch litter layer (sometimes this layer exceeds 5 to 6 inches) that virtually eliminates any current problems with soil erosion; however, it also precludes the development of robust ground vegetation. A general increase in the amount of downed dead woody material, compared to what is known exists with frequent fire forest conditions, was also noted.

Dry Mixed Conifer Sites

Dry mixed conifer forests are similar to ponderosa pine forests in general stand structure, but Douglas fir, white fir, white pines, and, occasionally blue spruce are also important components of these forests. Dry Mixed conifer forests typically occupy lower, warmer, and drier ends of the elevation zone occupied by mixed conifer forests. They intergrade with the cool/moist ponderosa pine types on warmer/drier sites at the lower end of the mixed conifer zone (GTR 310). Like the ponderosa dominated stands, the most significant current ecological condition in the dry mixed conifer sites is tree density. Significant increases in tree stocking, compared to historical tree data, now exist. The increased tree densities are represented by younger trees, and more shade tolerant species.

Historic conditions data indicated that on the more mesic sites within the Prescott Owl Rapid Assessment area, there were scattered individual, and small groups of interspersed, ponderosa pine and Douglas-fir, with some scattered white fir. Old individual oak trees (and some small groups) and some alligator juniper trees were also found within these stands. These dry mixed conifer stands were more open, and treeless interspaces were a part of the landscapes. Historic stocking on the north slopes and cooler, wetter drainages, was slightly higher than south-facing slopes and dryer sites. The data also indicated these areas historically supported white fir, and some aspen in addition to Douglas fir, with ponderosa pine and Gambel oak still being the most prominent tree species.

Woodland Species

In attempts to delineate the best 600 acres surrounding known nest and roost sites, other vegetation types are unavoidably included in MSO PAC designation. Alligator juniper and oak (primarily Gambel and Emory) historic evidences were common across the sampled landscape of MSO habitat, but in a much lower density, suggesting these species have remained a constant part of the vegetative structure in the area for a long time. In comparison to historic evidence, both piñon-juniper and oak species have been increasing in extent and densities, since pre-settlement times. It is evident that a decrease in fire frequency has been the probable cause of these increases. In consideration of historic frequent-fire effects in the area, re-introduction of frequent fire (3 to 7 year intervals) should be effective in restoring and maintaining historic conditions. If fire is not re-introduced on a periodic basis, it is probable that juniper and oak species will continue to increase in numbers and modify these sites accordingly.

Historic evidences of alligator juniper, both live and dead, provided an impressive view of this species dominating certain areas for hundreds of years. Alligator juniper is noted for its slow growth rate. It nearly ceases growth when moisture conditions are unfavorable but begins growing again with adequate moisture. This characteristic greatly enhances the ability of alligator juniper to survive in harsh, arid environments.

Existing Condition of Protected Activity Center, Core, and Recovery Habitats

Acres of Habitat

The amount of protected activity center and core habitats within the Hassayampa Project area are shown in Table 11. There are 4,746 acres of recovery habitat within the project area which are discussed separately.

Table 11. Mexican spotted owl protected activity center and core habitat within the Hassayampa Project area												
	Palace Station	Venezia	Silver Spruce	Mt. Pine Acres	Big Bug	Grapevine	Towers	Lorena Gulch	Snowdrift	Highland Pines*	Mt. Tritle*	Payoff*
Protected Activity Center Acres	552	540	549	514	579	500	705	571	308	76	10	3
Core acres	69	103	68	101	100	100	144	101	164	<1	1	<1

*Only portions of these MSO PACs occur within the project area.

Forest Structure

Several attributes of forest structure associated with nesting/roosting habitat were sampled in the eight protected activity centers completely within the project area boundary (Palace Station, Venezia, Silver Spruce, Mt. Pine Acres, Big Bug, Grapevine, Lorena Gulch, and Towers), as well as one of the five protected activity center with significant acreage overlapping the project area (Snowdrift), Snowdrift and Towers Protected Activity Center cores, and representative stands of recovery habitat. The stand exam data was used to inform the existing conditions for key habitat variables of the MSO PACs relevant to the desired conditions in the Recovery Plan (Table C2) as shown in Table 12. The Goodwin Fire burned 100 percent of the Grapevine Protected Activity Center at only low to moderate severity and 80 acres (14 percent) of the Big Bug Protected Activity Center at primarily low severity in July of 2017, and no changes were made to Forest Vegetation Simulator model runs for the no action and proposed action.

The habitat assessments in the following table are based on a combination of site specific stand exam data where available, aerial imagery interpretation, and field knowledge of the sites. Basal area from stand exam was used as an approximation for canopy cover (Mitchell and Popovich, 1996). A basal area of about 75 represents a canopy cover of about 40%. A canopy cover of about 60% correlates with a BA of about 114. Any BA greater than 114 cannot be used to approximate canopy cover and is assumed to be greater than 60% canopy cover. Because of the differences in the crown structure between pine and mixed conifer species, canopy covers might be expected to be slightly higher with the denser crown of mixed conifer.

Table 12. MSO PAC Existing Conditions for key habitat variables relevant to Recovery Plan Table C2. Desired Conditions for MSO PAC and recovery nest/roost habitats							
	Diversity of patch sizes (2.5 ac +)	**Horizontal and vertical heterogeneity**	**Tree species diversity – hardwoods and shade-tolerant**	**Diverse composition of herbaceous and shrub species**	**Opening sizes (0.1-2.5 acres)**	**Minimum canopy cover of 40% P/O, 60% M/C**	**Diversity of tree sizes; 16"+ >50%BA**
Big Bug (PIPO/QUGA)	Lacks patch diversity	Lacks horizontal diversity	Predominantly pine and oak species with some mixed conifer	Lacks species diversity due to lack in structural diversity	Lacks openings in the forest	Exceeds canopy cover minimums	Low on trees >18"dbh
Grapevine (PIPO)	Sufficient mix of conifer forest, woodland, chaparral, and riparian habitat	Sufficient diversity both horizontally and vertically	Sufficient diversity of hardwoods associated with riparian botanical area Some shade-tolerant species present due to lack of fire	Diverse composition of herbaceous and shrub species composition associated with diverse forested, upland, and riparian habitat mix	Plenty of openings in the PAC	Meets or exceeds minimum canopy levels in conifer vegetation	Lacks trees >18"dbh
Palace (PIPO/QUGA)	Lacks diversity of patch sizes	Lacking in both dimensions	Dominated by Gambel oak and other hardwoods	Very diverse stand of oak and chaparral shrub species	Lacks openings in the stand	Lacks conifer canopy	Lacking due to beetle kill and fire
Venezia (PIPO/QUGA)	Sufficient diversity of patches	Sufficient diversity in both directions	Sufficient mix of pine and oak species	Sufficient mix of oak and shrub species	Plenty of openings	Range of canopy cover in conifers	Lacks trees >18"dbh
Silver Spruce (Dry Mixed Conifer)	Lacks diversity of patch sizes	Contiguous stand lacks horizontal diversity	Sufficient oak component within conifer	Lacks herbaceous and shrub component due to lack of openings or horizontal diversity	Lacks openings in the stand	Dense dry mixed conifer exceeds canopy cover thresholds	Very dense stand of large trees
Mtn Pine Acres (Dry Mixed Conifer)	Sufficient on the east side, lacking on the west side	Sufficient on the east side, lacking on the west side	Pine-oak with dry mixed conifer and aspen – good species diversity	Sufficient diversity not evenly distributed throughout the PAC	On the east side yes, not on the west side	Exceeds minimum canopy cover thresholds	Low on trees >18"dbh
Snowdrift (Dry Mixed conifer)	Sufficient on the east side, lacking on the west side	Sufficient horizontal diversity	Dominated by shade-tolerant species – result of lack of fire	Sufficient diversity not evenly distributed throughout the PAC	On the east side yes, not on the west side	Dense dry mixed conifer exceeds canopy thresholds	Very dense stand of large trees
Towers (PIPO/QUGA)	Sufficient mosaic of patches of habitat types	Sufficient vertical and horizontal diversity	Sufficient mix of conifer and hardwood species	Sufficient diversity of herbaceous and shrub species associated with openings	Openings throughout the PAC	Wide range of canopy cover exceeds minimum canopy thresholds	Core has sufficient trees >18"dbh – Remainder of PAC is lacking these

Table 12. MSO PAC Existing Conditions for key habitat variables relevant to Recovery Plan Table C2. Desired Conditions for MSO PAC and recovery nest/roost habitats							
	Diversity of patch sizes (2.5 ac +)	**Horizontal and vertical heterogeneity**	**Tree species diversity – hardwoods and shade-tolerant**	**Diverse composition of herbaceous and shrub species**	**Opening sizes (0.1-2.5 acres)**	**Minimum canopy cover of 40% P/O, 60% M/C**	**Diversity of tree sizes; 16"+ >50%BA**
Lorena (PIPO/QUGA)	Sufficient mosaic of patches of habitat types	Sufficient vertical and horizontal diversity	Pine, oak, and woodland species with some dry mixed conifer	Sufficient diversity of herbaceous and shrub species associated with openings	Lots of openings in the PAC	Does not meet this due to two fires in the PAC	Lacks trees >18"dbh
Highland Pines – No stand exam for this PAC (76 acres - 1/6 of PAC in project area)	Sufficient mosaic of patches of habitat types	Sufficient vertical and horizontal diversity	Sufficient mix of conifer and oaks	Mostly oak and shrubs with little herbaceous	Openings throughout portion in project area	Meets minimum canopy cover	Lacks trees >18"dbh
Tritle (Dry Mixed conifer)	With only 10 acres in the Tritle PAC and 3 acres in the Payoff PAC, none of these habitat characteristics would be discernibly changed enough to impact the MSO PAC habitat quality of the territory. Therefore, the existing conditions of these is irrelevant to this analysis and discussion. Impacts to individual habitat components will be discussed.						
Payoff (PIPO/QUGA)							

General Environmental Consequences of Selected Alternative

Alternative 2–Selected Action

Effects of Hand thinning

Hand thinning areas would not be masticated; no mechanical treatments would occur. Non-mechanized fuel reduction treatments are proposed where slopes have a grade greater than 80 percent as well as in sensitive sites. Non-mechanized fuel reduction treatments would be carried out by hand with chainsaws. Cut vegetation would be scattered, piled and burned, or possibly removed, as follow-up treatments. Prescribed burning may be used as a follow-up treatment in thinned areas.

The non-mechanized fuel treatments are designed to remove primarily understory vegetation within various stands. These treatments would reduce competition among residual plants for space and nutrients leading to increased vigor and size for those remaining plants. These treatments would also open the stand canopies to allow more sunlight and water for herbaceous vegetation to develop, providing habitat for small mammals, reptiles and birds.

Effects of Mechanical Thinning

In southwestern ponderosa pine forests, old-growth trees are important to ecosystem structure and function. They increase genetic diversity on the landscape; old trees have greater genetic diversity than even-aged groups of young trees (Kolanoski 2002) and, thus, may have a better chance of adapting to changing climatic and environmental conditions, an ability they can pass on to their progeny. In addition, when not surrounded by large amounts of fuel, the thick bark of old-growth trees makes them largely resistant to low-intensity surface fire (Agee 1998). Old-growth trees also increase forest structural

diversity, which, in turn, provides more wildlife habitat. Promoting old-growth trees aligns with our purpose and need by improving the health and resiliency of fire-adapted ecosystems, reducing fire hazards in strategic locations and improving the quality of wildlife habitat while reducing the risk of catastrophic fire. The Prescott National Forest is committed to "retain at least historic frequencies of trees by species across broad age and diameter classes at the mid-scale. As such, the largest and oldest trees are usually retained" (Forest Plan, Guide-Veg-7, pg.76) and "prescriptions would retain pre-settlement trees as well as the largest trees in most cases" (Hassayampa EA pg. 257). In addition, the Forest does not intend on removing large trees that would conflict with existing recovery/conservation plan objectives for managing sensitive, threatened or endangered species or their habitat. Large trees (>18"dbh) would be removed per Resource Protection Measure C.3c (Appendix A) as appropriate to meet resource objectives and maintain safety measures.

Mechanical thinning is designed to develop conditions that would result in improved tree health and vigor as well as reduced risk of high-severity wildfires. Silviculture prescriptions focus on uneven-aged management and thinning from below. Treatments would reduce overstory tree stocking leading to improved vegetation health and vigor and enhanced diameter growth for residual trees providing more large trees across the landscape.

Open canopies would allow more water and light to reach the forest floor, leading to increased density and diversity of understory herbaceous and shrubby species. These vegetative components provide habitat features for small mammals and birds.

The primary purpose of these treatments is to reduce the density of trees across the landscape to achieve multiple objectives including fuel reduction, community protection, and forest restoration. This will be done mainly by removing the overabundance of small diameter trees in the understory through mastication and thinning. However, because the overstory is even-aged and over-crowded, large trees would also be slated for thinning. The treatments would reduce basal area in the ponderosa pine PNVTs based on the prescriptions for the various objectives. These prescriptions are developed using site specific pre-settlement information in concert with current literature on fire-adapted ponderosa pine ecosystems. Inherently, these treatments would reduce the canopy cover in these same areas especially as openings are created across the landscape. Short term impacts would include more open stands of less dense large trees. Herbaceous understory species would increase in the more open stands. In the long term, the canopies would close as trees grew to larger diameters and expand their crowns. Tree densities would be maintained through low intensity fires. Understory grasses, forbs, shrubs, and tree regeneration would occur in openings across the landscape.

Group selection harvest cutting would initiate a long-term process to change the current predominantly even-aged, broad-scale condition to a multi-aged condition comprising small groups of a given age-class on dispersed, and randomly located spatial areas of 0.5 to 2 acres. The current project would create such groups to collectively control about 20 percent of the broad-scale aggregate Ponderosa Pine-Gambel Oak PNVT, including constituent areas the dry mixed conifer with Frequent Fire PNVT, and the Ponderosa Pine-Evergreen Oak PNVT. Subsequent harvests at intervals of approximately 20 years would add new groups and age-classes.

Group selection harvest cutting would immediately initiate a new (low) vertical layer, in a dispersed small-group pattern, over approximately 20 percent of the broad-scale aggregate Ponderosa Pine-Gambel Oak PNVT, including constituent areas the dry mixed conifer with Frequent Fire PNVT; and the Ponderosa Pine-Evergreen Oak PNVT. Subsequent harvests at intervals of approximately 20 years would add new groups and age-classes that would vary from others with respect to their vertical position.

Where thinning would be conducted, in the spatially predominant forest matrix (outside new openings), the vertical forest structure would become more uniform for the next 20 years, pending creation of

additional age-classes in group openings. This uniformity is the result of low thinning methods that remove trees from the lower crown classes (layers) to favor those of the upper crown classes. However, by reducing density in a manner that focuses on retention of desirable groups or clumps, some vertical differentiation would occur between the upper tree canopy and lower-level vegetation growth that would occur in response to new micro-openings created between clumps.

Also, where thinning would be conducted, the balance of tree size-classes and forest stand structures would immediately change toward larger-diameter, upper-level trees, because proposed treatments focus on removing smaller, lower-level trees. Growth of retained large trees would improve and candidate groups or clumps would advance over time toward old-forest composition. Additionally, in new group selection harvest openings where large or old trees would be reserved in clumps or as individuals for future old-forest components, attainment of old-growth qualities would be advanced by removing all other mature trees and creating open understories.

The combination of these changed conditions would generally moderate potential fire behavior (torching and crowning), and increase the likelihood of old or large trees surviving any given fire event.

Both group selection harvest cutting and thinning would contribute positively to moderating potential fire behavior. Group selection would increase spatial-pattern (horizontal) diversity at the mid- and broad scales by making new openings that interrupt the current, somewhat continuous high forest canopy. Thinning would also increase spatial-pattern diversity, but at the fine or micro-scale (tree-to-tree, clump-to-clump), by reducing stand density and thereby increasing average spacing between crowns of trees retained as growing-stock, whether as individuals or clumps.

These structural changes, and their related activities that actually remove or dispose of some portion of the current woody fuels on the ground and in the lower canopy, are likely to moderate potential torching and crown-fire behavior, and therefore, also the severity of fire effects, at all but the most extreme fire weather conditions.

Most of the mechanized fuel treatments in the chaparral and oak vegetation types essentially shift the vegetative condition from an existing late-seral stage to an early-seral stage. The resulting condition creates opportunities for herbaceous vegetation such as grasses and forbs to grow. Also, woody species produce tender young sprouts for browse.

In the juniper and oak stands, larger overstory trees are retained and have more space and nutrients available contributing to increased individual tree vigor and health and fruit production.

Steep Slope Ground-Based Harvest Systems

Steep slope, ground-based harvesting typically makes use of a cut-to-length system, which consists of a harvester that cuts trees with a bar saw and then, without releasing them from its cutting head, de-limbs and processes them into logs. Limbs and tops are placed in front of the machine and are crushed down as the harvester moves ahead, creating a slash mat, which in turn protects the underlying soil. A forwarder then follows in the harvester's trail and loads the cut logs into log bunks on the bed of the machine. These logs are carried on the log bed to a roadside landing. Repeated trips by the forwarder on the trail crush the slash into the ground.

In the past, cut-to-length operations have been limited to slopes of approximately 40 percent; however, recent developments in technology now allow some models of harvesters and forwarders to operate on slopes of up to 65 percent slope for downhill forwarding and 45 percent uphill.

One major technological innovation is the use of flexible track bands, which are fitted over sets of multiple rubber tires and provide enhanced traction in steep terrain. These track bands limit the

occurrences of lost traction and the resulting rutting on steeper slopes. Rocks that protrude over 12 inches from the ground limit operability; however, rocks that are embedded in the ground without a vertical side above ground do not impede operation greatly.

Another recent technological innovation allowing for steep slope, mechanical harvesting involves the use of a traction assist winch (winch-assist). This tool employs a remote-controlled cable winch that is connected to an anchor and can be used to slowly raise, lower, or stop equipment's progress on the slope. The winch-assist is not designed to pull equipment up a slope, but instead is used to increase traction and reduce slippage and soil disturbance. Using winch-assist technology, steep slope, ground-based harvesting systems can operate on slopes of up to 80 percent for downhill forwarding and 65 percent uphill with minimal soil disturbance.

This approach is being used in other regions and is currently included in planned treatments on National Forest System lands in Arizona. If the equipment is unavailable for this project, the steepest slopes would be hand thinned.

Mechanical thinning on steep slopes is more of a fuels treatment to thin from below to remove ladder fuels targeting smaller diameter trees within the stand. These treatments do no effectively reduce the basal area of larger size class trees. Thus, there would not expect to be a discernible change in the canopy cover for these areas. Designated skid trails about 15 ft wide would provide opportunities for openings to create horizontal heterogeneity and increase diversity of herbaceous and shrub components. These treatments are designed to reduce the risk of fire in stands where they are implemented.

Disposal of slash can include removing fuels from the site. However, it can also include both pile burning as well as broadcast burning as determined by site specific needs for the resources involved.

In summary, the proposed action would allow a more resilient forest condition to develop—one in which some trees are likely to survive a crown fire and function to regenerate the site via natural seeding eventually initiating an uneven-aged silviculture system of group selection; controlling the density of retained growing-stock through thinning; and continuing this system through future cutting cycles.

Effects of Mechanized Fuel Reduction (Mastication)

Thinning the trees in ponderosa pine, pine-oak, and dry mixed-conifer forest types would reduce fuel loading and improve forest health and help create a residual stand structure and level of fuels that would reduce the potential for crown fire under typical weather conditions that occur in the project area. Due to the mosaic pattern of vegetation transitions on the landscape, mastication (mechanized fuel reduction) is proposed in chaparral, pinon- juniper, and evergreen oak vegetation where appropriate on slopes less than 40 percent grade including inclusions in forested PNVTs. Areas that are masticated may have subsequent prescribed burning treatments.

Mechanized treatments are foremost designed to restructure the vegetation so that subsequent prescribed fire has the desired effect on the residual vegetation. Where slope and access allow, mechanized treatments are a preferred course of action for preparing an unbalanced landscape to receive fire appropriately. The ultimate objective of masticating is to reduce flame lengths. Mastication treatments would primarily change the structure of understory vegetation reducing competition among residual plants for space and nutrients leading to increased vigor and size for those remaining plants. These treatments would also open the stand canopies to allow more sunlight and water for herbaceous vegetation to develop, providing habitat for small mammals, reptiles and birds. Resource protection measure H-7 calls for an optimal slash depth of 1-2 " and not more than 3". Subsequent prescribed burning would ensure that this resource measure is attained.

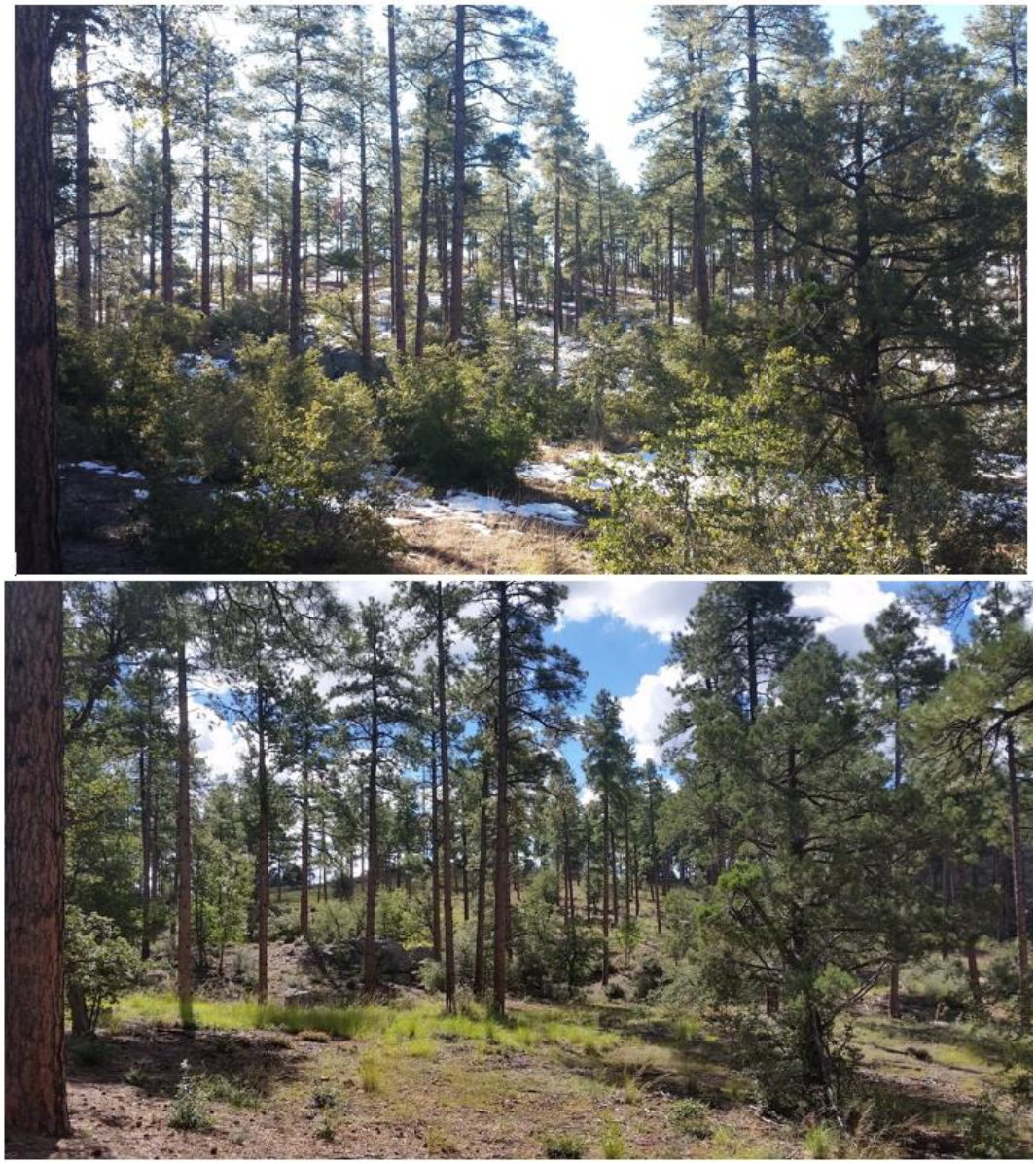


Figure 1. Before (above) and after (below) photos of mastication treatment prior to prescribed burning in a ponderosa pine stand.

Effects of Fuelbreak Construction

Proposed fuelbreaks would be linear in shape and up to 5 chains (330 feet) wide. Fuelbreaks would be constructed on approximately 10,665 acres within the project area, of which 9,616 acres would be mechanically thinned and 1,049 acres would be hand thinned. Treatments within fuelbreaks for different vegetation types would tend to fall nearer the lower basal area for the mechanized and non-mechanized thinning guidelines described in the environment assessment, unless the site is stocked exclusively with chaparral vegetation. In those cases, all chaparral vegetation would be removed. To effectively create breaks in the fuel loading, all dead trees, regardless of size, would be removed, as would some large trees. Tools for creating fuel breaks include masticators, mechanized equipment for traditional ground based operations, steep slope equipment and chainsaws. Fuelbreaks would be maintained by prescribed burning, mechanized, or non-mechanized means.

Effects of Treatment in Aspen Habitat

Mechanical thinning is the primary tool for treatments in aspen stands. Aspen treatments are proposed for 8 acres of protected activity center habitat and 10 acres of core habitat to create up to 27 acres of aspen in protected activity center habitat and 20 acres in core habitat away from the known nest stand (Map 21). Aspen treatments differ based upon location in protected activity centers as opposed to core areas. Mechanical thinning would be used for aspen treatments and the overall effects would be to move these small areas toward desired condition noted on page 39 of the Forest Plan. Prescriptions would include removing large encroaching conifers from within and around the aspen stands as well as removing over mature aspen to prompt sprouting of regeneration. Because aspen are shade-intolerant and reproduce primarily by sprouting from roots after disturbance, it is necessary to create conditions that allow full sunlight to reach the forest floor. Aspen prescriptions include removing trees from within and beyond the extent of the current stand to provide optimal conditions for aspen regeneration. Because of the design of the treatments to open up the stands, 18 acres of aspen becomes 47 acres. Instead of losing the aspen component within MSO habitat, this project is designed to retain and enhance this unique ecological component of MSO and prey habitat.

Discussions with USDI USFWS revealed that removing some large, old decadent aspen may be necessary to stimulate sprouting and regeneration by residual aspen. Aspen treatments within the core of Mexican spotted owl protected activity center habitat would be located away from known nest sites. In Mtn Pine Acres MSO PAC we will protect the known nest in the core and treat aspen away from the nest in the small area we identified on the map (Map 21).

Prescription will also include cutting some big aspen to stimulate regeneration or sprouting in the residual aspen clone followed by prescribed burning.

Effects of Temporary Roads

Existing National Forest System roads and approximately 21 miles of temporary roads would be used. To minimize impacts to the environment and natural resources, previously disturbed areas are used whenever possible, including old temporary or non-system road locations. Non-system roads will be decommissioned after access for mechanical treatments is no longer needed.

The effects of temporary road construction to wildlife habitat include removal of trees and understory vegetation along the linear road alignment. During the use of the temporary road, the habitat quality along the linear configuration of the road is diminished due to disturbance associated with use from vehicles, equipment, and people. With a road prism width of 8.25 ft, each mile physically impacts approximately 3 acres of habitat; then about 63 acres of habitat would be impacted by temporary road construction. After the roads are closed and obliterated, the disturbed area would provide habitat in the created opening for early-seral-stage species.

Effects of Prescribed Fire

Effects of prescribed fire in forested habitats will vary based on the existing conditions, the structure of the vegetation and the combination of treatments used in the stand. Due to the lack of fire across the landscape, much of the vegetation needs to be restructured through treatments before fire can safely be put back on the landscape. For those sites treated prior to the use of fire, the change in the vegetation structure would create conditions such that most of the pine type would experience low intensity fire effects that would remove shrubs and small trees from the understory. Control lines for prescribed fire units will be designed and located to be effective while considering both strategy as well as resource impacts.

For those areas that cannot be treated by mechanical or other means prior to the use of fire, the effects of the fire may be more on the scale of moderate fire effects with occasional inclusions of high intensity fire effects. Moderate fire effects would include removing small trees, understory vegetation, and some overstory trees, thereby reducing competition for space and nutrients. Residual trees would gain improved vigor and increased diameter and height growth. The typical vegetation response to fire in conifer sites is a flush of herbaceous understory vegetation.

Prescribed burning would occur on an average of 4 percent of National Forest System lands within the project area annually. Much of the prescribed burning would occur in conjunction with the mechanical forest treatments discussed above. Whether burning piles or broadcast burning slash or after mastication, many of these burns would be expected to be low intensity burns in previously treated areas that would change the vegetation only slightly post-treatment.

The mortality associated with the prescribed burn portion of the FVS model in 2021 does not accurately reflect the intensity of the prescribed burning that is implemented on the Prescott NF, particularly within MSO habitat.

For example, the existing Basal Area for the Towers PAC outside the core is 97, which is lowered to 80 after mechanical treatment and then 51 after prescribed burning based on the modeling. Knowing these modeling results do not meet desired conditions, the actual burn prescriptions for different units would be designed specifically to meet the resource objectives and target basal areas based on the vegetation conditions after the initial treatment. Tree mortality associated with prescribed burning would be expected in smaller trees less than 8”dbh with an occasional larger tree lost, but certainly not 30 BA of trees. These projected RX burn effects in the FVS runs may account for the lack of basal area recovery post-modeled RX burn that fall short of the desired condition for MSO PAC habitat all the way out to 2057.

Starting with the 80 BA post-mechanical treatment, implementing the light intensity RX burns intended for this habitat and maintaining it with burns approximately every 3-10 years, it would be expected that the residual stand of trees would have increased vigor and nutrients and eventually produce and increase the BA for the stand by 2057.

This reasoning also applies to the BA for the Recovery habitat treatments that fall short of the desired conditions for BA in 2057.

However, there are a few places across the landscape that may not lend themselves to treatment prior to the use of fire in an area. In these areas, the prescription for the fire may be to thin both the smaller (<9”dbh) trees within a stand as well as create openings or create limited mortality in mature trees in an effort to reduce tree densities and move towards desired conditions for the stand. Prescribed burning in the conifer vegetation types would remove some small trees and understory vegetation, thereby reducing competition for space and nutrients. Therefore, residual trees would gain improved vigor and increased diameter and height growth. The typical short term vegetation response to prescribed fire in ponderosa pine sites is a flush of herbaceous understory vegetation providing considerably increased and improved habitat for many small mammals, reptiles and birds. While treatments are proposed on every acre through a computer exercise using coarse scale imagery and mid-scale vegetation classification; that may not always be physically or fiscally possible on the ground. For areas that cannot be treated prior to the use of fire, occasional inclusions of high intensity fire effects may occur as ladder fuels provide routes for fire to get into canopies and remove overstory trees. These inclusions would create or provide for the openings within patches described in the desired conditions.

Direct and Indirect Effects to Mexican spotted owl and their habitat

All activities and treatments proposed within the Mexican spotted owl protected activity centers, cores, and recovery habitat are designed to comply with the current Forest Plan, Forest Plan biological and

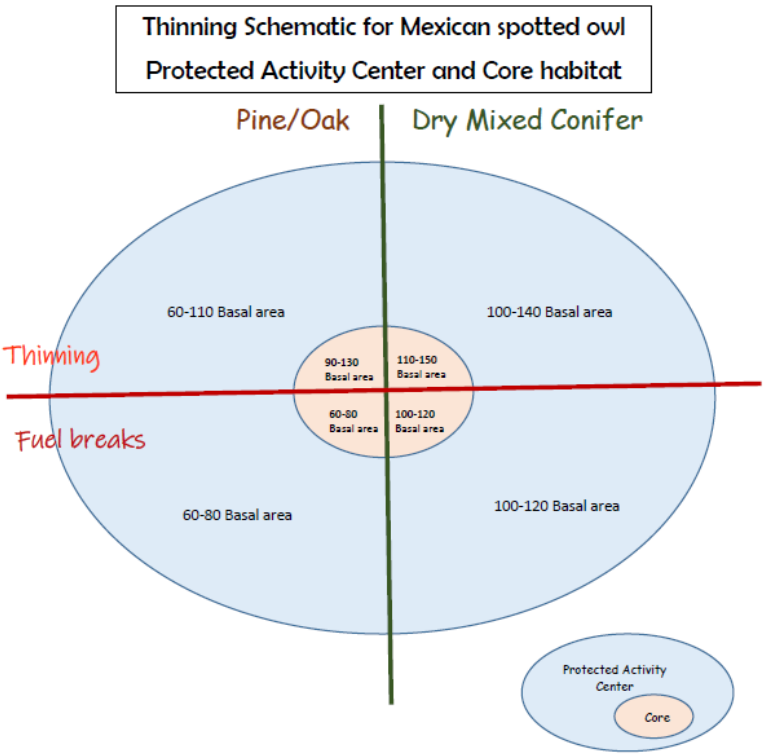
conference opinion terms and conditions, and should apply Recovery Plan habitat management objectives. All activities within protected activity centers are being coordinated with the USDI USFWS. Prescriptions will be developed in concert with the USDI USFWS specifically for the Hassayampa Project. Breeding season timing restrictions would apply to all activities within Mexican spotted owl protected activity centers and extend one quarter mile beyond the boundary of each Mexican spotted owl protected activity center for all treatments unless PAC is determined to be in non-nesting status through formal survey protocol.

Actual implementation on the ground is expected to be adapted to the site specific resource objectives and priorities for the location. Resource managers used BEHAVE and modeled flame length, rate of spread, and fire type for both alternatives. All of the various treatments and tools are proposed to be used to move the vegetation towards the desired conditions in the long term

Table 13 summarizes treatment types and acreages proposed for the Hassayampa Project area.

Table 13. Summary of treatments within Mexican spotted owl PAC habitats

	Total Acres Within Project Area	Fuelbreak Hand Thin Acres (%)	Fuelbreak Mechanical Acres (%)	Mechanical Thin Acres (%)	Hand Thin Acres (%)	Prescribed Fire Acres (%)
Protected Activity Centers	4,907	54 (1)	1,000 (20)	3,150 (64)	517 (11)	4,907 (100)
Cores	952	17 (2)	164 (17)	525 (55)	183 (19)	952 (100)
Recovery Habitat	4,745	78 (2)	562 (12)	2,638 (56)	658 (14)	4,745 (100)



This schematic explains the desired basal areas thinning and fuel breaks in MSO PAC and core within both pine/oak and dry mixed conifer vegetation types.

Table 14. Acres and percentages of protected activity center habitat affected by treatment type						
Mexican Spotted Owl Protected Activity Center	**Total Protected Activity Center Acres Within Project Area**	**Fuelbreak Hand Thin [Acres(%)] Protected Activity Center**	**Fuelbreak Mechanical [Acres(%)] Protected Activity Center**	**Mechanical Thin [Acres(%)] Protected Activity Center**	**Hand Thin [Acres(%)] Protected Activity Center**	**Prescribed Burn [Acres(%)] Protected Activity Center**
Palace Station	552	0	20(4)	532(96)	0	552(100)
Venezia	540	0	<1(<1)	462(86)	78(14)	540(100)
Silver Spruce	549	0	170(31)	379(69)	0	549(100)
Mt. Pine Acres	514	0	130(25)	384(75)	0	514(100)
Big Bug	579	<1(<1)	117(20)	454(78)	4(<1)	579(100)
Grapevine	500	0	17(3)	117(23)	359(72)	500(100)
Towers	705	54(8)	360(51)	237(34)	51(7)	705(100)
Highland Pines	76	0	0	49(64)	25(33)	76(100)
Payoff	3	0	0	3(100)	0	3(100)
Lorena Gulch	571	0	85(15)	319(56)	0	571(100)
Snowdrift	308	0	93(30)	214(69)	0	308(100)
Mt. Tritle	10	0	8(80)	<1(<1)	0	10(100)
Total Acres	**4,907**	**54(1)**	**1,000(20)**	**3,150(64)**	**517(11)**	**4,907(100)**

Table 15. Acres and percentages of core habitat affected by treatment type						
Mexican Spotted Owl Protected Activity Center	**Total Core Acres Within Project Area**	**Fuelbreak Hand Thin [Acres(%)] Core**	**Fuelbreak Mechanical [Acres(%)]Core**	**Mechanical Thin [Acres(%)]Core**	**Hand Thin [Acres(%)]Core**	**Prescribed Burn [Acres(%)]Core**
Palace Station	69	0	0	69(100)	0	69(100)
Venezia	103	0	0	82(80)	21(20)	103(100)
Silver Spruce	68	0	10(15)	58(85)	0	68(100)
Mt. Pine Acres	101	0	42(42)	59(58)	0	101(100)
Big Bug	100	0	15(15)	86(86)	0	100(100)
Grapevine	100	0	0	<1(<1)	99(99)	100(100)
Towers	144	17(12)	28(19)	36(25)	63(44)	144(100)
Highland Pines	<1	0	0	<1(<1)	<1(<1)	<1(<1)
Payoff	<1	0	0	<1(<1)	0	<1(<1)
Lorena Gulch	101	0	27(27)	12(12)	0	101(100)
Snowdrift	164	0	42(26)	122(74)	0	164(100)
Mt. Tritle	1	0	<1	0	0	1 (100)
Total Acres	**952**	**17(2)**	**164(17)**	**525(55)**	**183(19)**	**952(100)**

Effects of Hand thinning on MSO and its habitat

Hand thinning is proposed in 5 of the 12 PACs and 4 of the 12 cores. Assuming that all breeding season timing restrictions discussed above are complied with, hand thinning with chainsaws on steep slopes could disturb and displace non-nesting MSO from their home territory during the breeding season. Also, noise from chainsaws operating in non-nesting PACs could disturb breeding owls in adjacent nesting PACs depending on topography and vegetation structure. Given how late in the season the non-nesting PACs would be cleared for activity, with a significant investment in a breeding attempt, breeding owls in adjacent nesting PACs may not be likely to abandon any nestlings they may have. Activity in PACs outside of the breeding season may also disturb non-nesting owls using the territory causing them to be displaced and to move to unfamiliar habitat to roost and forage.

Hand thinning will mainly remove small diameter trees or shrubs which will reduce competition among trees, remove ladder fuels, and create vertical diversity within stands. These short term changes in the vegetation structure may result in a short term temporary reduction in quality of habitat for some prey species. It may also result in an immediate increase in quality of habitat for other prey species. The short term effect will be a change in foraging habits for resident owls especially in their first season after treatments. Adjusting to the changed conditions may have detrimental impacts to breeding and nesting success for the owls as they expend additional energy to become familiar with the changed foraging conditions. The long term effect will be improved prey species habitat providing higher quality foraging habitat for MSO. As much as prey availability is a factor, this could have beneficial effects to breeding and nesting MSO and their success rates.

Effects of Mechanical thinning including Mechanized fuel reduction (Mastication) on MSO and its habitat

Mechanical thinning is proposed for 3,150 acres (64 percent) of protected activity center habitat, 525 acres (55 percent) of core habitat, 2,638 acres (56 percent) of recovery habitat.

Mechanical thinning is proposed in part of all 12 of the PACs and 11 of 12 cores in the project area. Mastication is a subset of the mechanical thinning and is proposed in 2 of the 12 PACs.

Projects implemented in non-nesting MSO PACs during the breeding season could disturb non-nesting owls causing them to leave their territory to roost and forage in unfamiliar habitat. Noise from machinery in a non-nesting PAC could disturb nesting owls in an adjacent MSO PAC depending on topography and vegetation structure. Given how late in the season the non-nesting PACs would be cleared for activity, with a significant investment in a breeding attempt, breeding owls in adjacent occupied PACs may not be likely to abandon any nestlings they may have. Activity in PACs outside of the breeding season may also disturb non-nesting owls using the territory causing them to be displaced and to move to unfamiliar habitat to roost and forage. Where breeding season timing restrictions apply, they will be applied to all aspects and activities of implementing thinning treatments.

Thinning projects are designed primarily to reduce tree densities and improve forest health with no particular focus on removing specific species. The short term effects of these projects include fewer overstory trees, less canopy cover in the overstory, less dense understory in trees and shrubs, and openings created in the vegetation. This change in vegetation composition and structure would be expected to influence the small mammal and song bird composition of prey species available for MSO probably causing them to shift their foraging habits in the short term. The initial response of the vegetation to these treatments is a flush of new vegetation including grasses, forbs, and shrubs in the understory and openings. Overstory trees are released from competition and retain more of their crowns which increases their vigor and health and resistance to insect, diseases, and drought. The long term changes would be expected to provide more diverse high quality habitat for prey species and improved foraging habitat for MSO.

Target basal area for ponderosa pine stands in MSO PACs would be 60-110 in pine-oak and 100-140 in dry mixed conifer. Within cores the target basal areas would be 90-130 in pine-oak and 110-150 in dry mixed conifer. Based on FVS model projected effects of the mechanical treatments, all of the PACs and cores would be within this range immediately after treatments. Long term, basal areas would be expected to increase after mechanical treatments with no discernible change in basal area from the effects of prescribed fire. Therefore, the basal areas and associated canopy covers for PACs and cores would continue to be within the desired range for both of these habitat components. These target basal areas would be expected to retain and enhance the canopy cover providing shade and cooler temperatures preferred by MSO in nest/roost stands. Implementation monitoring will track these basal area and canopy cover habitat parameters.

Thinning treatments also create openings across the landscape thereby creating horizontal diversity within and among stands. These openings provide for tree regeneration as well as herbaceous and shrub species diversity. Thinning treatments also create or change patch sizes and heterogeneity across the landscape by breaking up the continuity of the canopy. These changes subsequently change the horizontal heterogeneity across the landscape. All of these changes in vegetation structure and composition contribute to increased quantity and quality of prey species habitat diversity providing better foraging habitat for MSO long term.

Where stands are lacking in large trees, thinning treatments create conditions for trees to grow larger rather than continuing to compete in densely overstocked stands. For those areas with an overabundance of large trees, thinning smaller trees and removing some overstory trees will provide optimal conditions

for retaining and growing large trees, making them healthier, more resilient to insect and diseases and longer lived.

These changes in structure would move the Mexican spotted owl habitat towards the desired conditions in Table C.2 of the recovery plan. A diversity of patch sizes would be an inherent result of group selection and lead to the creation of horizontal and vertical heterogeneity within and among patches. Tree species diversity would increase as understory Gambel oak are released from pine overstories and overstocked stands are balanced in species composition. The composition of the native herbaceous and shrub species would be expected to drastically diversify as openings are created and light and water can reach the ground between trees. Openings created in the forest canopy would mimic natural distribution patterns on the landscape and provide prey habitat throughout Mexican spotted owl habitat. Canopy cover would be maintained at desired levels as crowns are released and retained through thinning. Remaining trees would have more room and nutrients to grow to larger diameters to occupy an increased percentage of the live basal area of the stand.

These changes in the structure of the MSO PAC habitat outside of the breeding season may cause some changes in habitat use by MSO. When suitable nesting habitat is provided, MSO tend to forage in a wider array of habitat conditions (Ganey et al 2011). Treatments around the nest and roost stands will be designed to retain large trees and hardwood components while improving the quantity and quality of understory vegetation that is the crux of most prey species' habitat needs. The combination of treatments could be expected to provide higher quality habitat for MSO possibly contributing to increased fecundity and reproductive success as much as food may be a factor in this process. As trees grow into the larger diameter classes and develop old growth characteristics mentioned above, the landscape will better provide suitable nesting and roosting habitat for MSO that is resilient to the impacts of fire.

For those areas proposed for steep slope thinning, the primary effect to the stand would essentially be an understory thin from below removing smaller trees. Lanes where the equipment would operate would be opened up and create openings in the stand. Because the equipment will not be designed to handle large trees, placement of the lanes would avoid large trees. The lanes will need to be a certain distance apart in order to reach most of the stand. The Prescott NF will work directly with the FWS to agree upon where landings may or may not be located based on the needs of the MSO and the physical limitations of the equipment and the topography of the treatment area.

The effect to the stands from steep slope thinning will be increased vertical diversity as ladder fuels are removed in some areas and not in others. There would not be a change in basal area of large trees or in the canopy cover of the overstory.

The three primary haul routes for this project include the Senator Highway, Big Bug Mesa Road, and the Walker Road. Approximately 5-10 loads would be expected daily. The general schedule of timing for priorities for implementing the forest health facets of this project can be found in the Map 46 in Appendix B. It is expected to be implemented over the 10 years following the decision, contingent upon available funding.

While road locations are set, locations for landings are typically dictated by the topography, soils, and access. Needs of threatened species habitat is also another consideration that will be addressed site specifically for each treatment. General design features can be developed and applied as the landscape allows. Every effort will be made to avoid locating landings within MSO PAC and especially core habitat. Deviations from any agreed upon design features influenced by site specific conditions or limitations that are currently not known would be discussed with FWS prior to final design or implementation.

While many familiar features of the MSO habitat will remain, some key habitat components may be impacted by the treatments short term. Where an overabundance occurs, some trees greater than 16" dbh will need to be removed to make room for the larger trees on the landscape. Openings may be created

where none had previously occurred. The canopy cover may be initially reduced from the existing level until residual trees respond to the increased space and nutrients with more robust crowns. Understory plants may be removed or simply cut down triggering sprouting among the shrubs. As soil is exposed to sunlight and water, seeds of grasses and forbs lying dormant in the soil will be able to sprout and flourish. As the habitat is changed through time, the MSO will hopefully adapt to the changes as the dynamic nature of the landscape is restored.

Mechanized mastication projects are designed to remove understory species of trees and shrubs including chaparral, pinon-juniper, and evergreen oak. These treatments create vertical diversity within stands. These treatments change the understory of decadent old shrubs to young shrubs with tender shoots of re-growth while retaining the overstory creating vertical diversity. The main effect to MSO would probably be a shift in the prey species using these areas and thus a change for the owls in their foraging tactics or prey selection including shifting to foraging away from these areas at least for the first season after treatment.

These changes to the physical structure of the vegetation are intended to be moving these stands closer to the desired conditions for MSO nest/roost habitat. In the long run, these treatments should provide higher quality habitat for MSO in the long term.

Effects of Fuel Breaks on MSO

Hand thinned fuel breaks are proposed in 2 PACs and 1 core; mechanical fuel breaks are proposed in 10 PACs and 7 cores. These fuel breaks are a result of the juxtaposition of the private parcels within MSO habitat. Protecting life and property is a primary purpose of this project. Creating fuelbreaks along private property boundaries is an essential part of effectively reducing the risk of catastrophic fire on the landscape. Breeding season timing restrictions would be implemented.

Constructing fuel breaks in non-nesting MSO PACs during the breeding season could disturb non-nesting owls causing them to leave their territory to roost and forage in unfamiliar habitat. Noise from chain saws or machinery in a non-nesting PAC could disturb nesting owls in an adjacent MSO PAC. Given how late in the season the non-nesting PACs would be cleared for activity, with a significant investment in a breeding attempt, breeding owls in adjacent occupied PACs may not be likely to abandon any nestlings they may have. Activity in PACs outside of the breeding season may also disturb non-nesting owls using the territory causing them to be displaced and to move to unfamiliar habitat to roost and forage. Where desired, shaded fuelbreaks can be designed in forested sites.

Fuelbreaks are designed to change the vegetation structure immediately adjacent to private property in such a way as to change the behavior of fire to lower the intensity of the fire and shorten the flame lengths. Understory within fuelbreaks occurring within protected activity centers would be masticated where slope allows (see photos in vegetation write up). The effects of the fuel breaks to vegetation within Mexican spotted owl protected activity center habitat would be similar to the aforementioned effects of mechanized and non-mechanized treatments, but removal of understory vegetation may be more thorough in fuel breaks to remove potential ladder fuels. In forested areas outside of MSO habitat, canopy cover would fall near the low end of the desired condition in shaded fuel breaks. The immediate short term effects would be reduced existing prey species habitat until the vegetation responds to the treatment. This may cause owls to forage in different or further away places until the vegetation and associated prey base responds to the treatments as well. The long term result would be expected to produce increased herbaceous vegetation response providing an improvement in the quantity and quality of habitat for a wide variety of small vertebrate prey species. This would provide improved foraging habitat for MSO.

In un-forested fuel breaks, the majority of the vegetation within the corridor would be removed.

Figure 2. Shaded fuel break in pine-oak stand.

To create effective fuel breaks, coarse down woody materials and snags would be expected to be reduced or removed on these small areas. Sound snags would be retained while soft snags would be felled and piled and burned to reduce coarse woody fuel loading. Both of these habitat components would also continue to be available throughout the remainder of the PAC to provide prey species habitat. The immediate short term effects would be reduced existing prey species habitat until the vegetation responds to the treatment. This may cause owls to forage in different or further away places until the vegetation and associated prey base responds to the treatments as well. This could be as short as a single season.

How owls respond to forest thinning treatments is grossly understudied (Wan et al 2018). One possible scenario is, given their strong site fidelity, the owls may take a while to adjust to the change in the physical structure of the vegetation within fuel breaks within their PACs or cores. However, the vertical and horizontal diversity as well as openings created and herbaceous and shrub species diversity increased in these areas would provide habitat quality improvements for a diverse array of prey species. Because owls have evolved with fire, changes in their habitat structure are a normal occurrence. Another possible scenario is that the resident owls may move out of the habitat, while other owls may move in. The tradeoff is the short term effects site specifically to individual owls versus the landscape benefit of reducing the risk of losing a large contiguous block of MSO habitat to a stand replacing fire.

Where forested fuel breaks are proposed within cores and near known owl nest sites, the Prescott NF will work with the USFWS to design site specific effective fuel breaks in these areas. Where fuels treatments are deemed necessary within PACs, managers must balance fuels reduction goals with short- and long-term conservation of owl habitat, recognizing that drastic alterations to PACs may render them of lesser value for Mexican spotted owls, at least in the short-term (MSO RP pg 258). As discussed with FWS in the field, the fuel breaks are analyzed for 5 chains wide, site specifically identified by PAC (see individual PAC maps and write-ups), and could possibly be constructed during the breeding season if the PAC is deemed in non-nesting status per formal protocol surveys. Shaded fuel breaks in cores or near nest sites would retain adequate canopy cover where available. Based on FVS model data, respective canopy cover minimums for pine-oak and dry mixed conifer will meet minimum desired conditions in Table C.2. where available. The Management Recommendation #3 for Protected Activity Centers in the MSO Recovery Plan (pg 261) may not be met in fuelbreaks where key habitat variables may be removed in order to meet

this project's primary purpose and need of protecting life and property instead of being compatible with secondary owl habitat management objectives.

Facets of desirable habitat structural characteristics may be present in the fuel breaks, such as openings, vertical diversity, horizontal diversity, and diverse herbaceous species.

Effects of Aspen Treatments on MSO

Aspen treatments are proposed in 3 PACs (Maps 21 (Mtn Pine Acres), 24 (Snowdrift), and 27 (Towers)) and 1 core (Mtn Pine Acres (Map 21)). Aspen is a limited and dwindling habitat component across the landscape. Aspen contributes immense diversity to MSO habitat and the landscape in general. Retaining existing stands of aspen is vital to the diversity of the landscape. Aspen cannot simply be "planted" or replaced somewhere else on the landscape. These treatments are proposed to retain and enhance the aspen components where they exist within MSO habitat.

In order to retain and expand the aspen where it occurs, large conifers encroaching due to lack of fire must be removed. Understory conifers would also be removed. In order to stimulate sprouting regeneration, some large aspen may also be removed as well. The treatments would occur beyond the current extent of the aspen in order to expand the occurrence of aspen to a greater potential than existing extent. The treatment in the core area is proposed away from the known nest sites.

Implementing aspen treatments in non-nesting MSO PACs during the breeding season could disturb non-nesting owls causing them to leave their territory to roost and forage in unfamiliar habitat. Noise from chain saws or machinery in a non-nesting PAC could disturb nesting owls in an adjacent MSO PAC. Given how late in the season the non-nesting PACs would be cleared for activity, with a significant investment in a breeding attempt, breeding owls in adjacent occupied PACs may not be likely to abandon any nestlings they may have. The ¼ mile buffer beyond occupied PAC boundaries during the breeding season would be implemented. Activity in PACs outside of the breeding season may also disturb non-nesting owls using the territory causing them to be displaced and to move to unfamiliar habitat to roost and forage.

Removing large overstory conifers and understory trees surrounding aspen may drastically change the physical appearance of the habitat in MSO PAC and cores. Resident MSO may be uncomfortable with the unfamiliar structure of their territory and may no longer use the site. However, if key habitat variables for nesting and roosting are provided at desired levels, the owls' strong site fidelity may influence them to continue to use their territory through the vegetation transitions. If not, perhaps dispersing owls may find the new territory acceptable to their needs. Away from known nest sites, these aspen treatments will create high quality foraging habitat within the cores and PACs providing highly diverse prey species habitat components in the midst of a conifer forest. These treatments will create key habitat variables for MSO nesting/roosting habitat including vertical and horizontal heterogeneity, openings, diversity of herbaceous and other hardwoods, and diversity of patch sizes.

Effects of Prescribed burning to MSO and its habitat

Through a computer planning exercise, prescribed burning is proposed on every acre of MSO habitat. Control lines for prescribed burn units will be located and designed to be effective while considering both strategy and resource impacts. Breeding season timing restrictions will apply to control line construction as well as prescribed burning. If formal monitoring to protocol determines a PAC to be in non-nesting status, control line construction may occur during the breeding season as well as prescribed burning. The status of adjacent MSO PACs will also be considered when implementing prescribed fire in MSO PACs. The ¼ mile buffer around occupied PACs during the breeding season would be observed. Pre-treatment through mechanical and hand thinning to change the vegetation structure is proposed on all acres except for portions of the Lorena Gulch PAC and core. The effects of the recent Lane II Fire to the vegetation

have essentially “pre-treated” these areas so they do not require any treatment prior to prescribed burning. These treatments proposed prior to prescribed fire will create conditions for fire to produce the desired results in vegetation effects across the landscape.

Prescribed fire is designed to behave naturally on the landscape removing vegetation commensurate with the intensity of the fire. Direct effects to MSO could occur, particularly from projects during the breeding season. Smoke from prescribed burns in areas adjacent to protected activity center habitat beyond the ¼ mile buffer could negatively impact reproducing owls during the breeding season.

While the owl is associated with a fire-adapted ponderosa pine ecosystem, there may be some negative impacts from smoke to nesting owls during the breeding season. Smoke from adjacent prescribed burns during the breeding season beyond the ¼ mile buffer may drift into occupied MSO PACs during the breeding season. Smoke could impact nesting and non-nesting owls alike, causing everything from slight disturbance and movement to nest abandonment or egg/nestling mortality. Smoke impacts to owls would vary with the intensity of the smoke experienced by the owls. With good smoke dispersal designed into the prescriptions, extreme negative impacts to owls would not be expected to occur with most of the prescribed burns. A review of the literature did not reveal any research in particular on the impacts of smoke to Mexican spotted owl, only the effects of fire to physical habitat features. Bond et al. (2002) hypothesized that spotted owls may have the ability to withstand the immediate, short-term (1 year) effects of fire occurring at primarily low to moderate severities within their territory.

Another aspect of prescribed burning is preparing fire lines around burn units. This is typically done during the early spring and summer months when fire crews are available to do the work. Discussions with FWS concluded that if formal survey protocol determine that a Mexican spotted owl territory is in non-nesting status, fire line construction and prescribed burning (including pile burning) may occur during the remaining portion of the current breeding season. These activities may disturb non-nesting MSO still using the territory and may cause animals to move away from the disturbance. The breeding status of adjacent MSO PACs would need to be considered so that the ¼ mile buffer for those PACs was observed if they were found to be in breeding/nesting status.

Outside of the breeding season, smoke and prescribed fire may impact non-nesting owls in the PAC habitat, causing them to move to other habitat than that which they prefer.

Prescribed fire is proposed on every acre of MSO habitat. The use of prescribed fire on the landscape is ultimately intended to change the vegetation. Effects of low intensity fire include removing understory shrubs, small trees and herbaceous plants in the short term. This will cause an immediate reduction in the quantity and quality of prey habitat for MSO. This could cause owls to move to another area to forage, possibly creating conflict or competition among neighboring owls. Another possibility is that displaced owls may be forced to forage in less than optimal or unfamiliar habitat if all the territories are occupied.

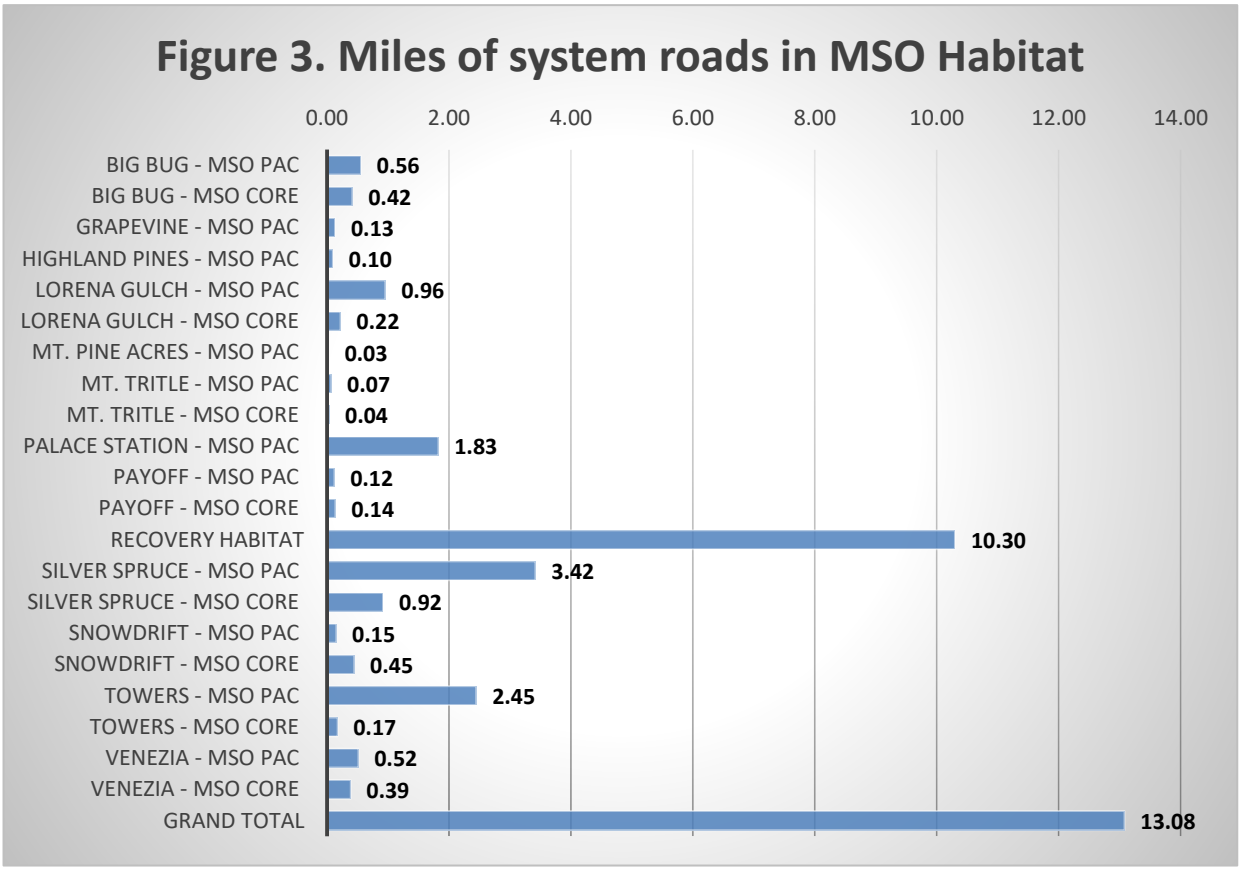
However, this reduction is short-lived as the typical response to fire in pine stands is a flush of growth among the grasses and shrubs, creating high quality habitat for many MSO small mammal and bird prey species. Timing for all of this will be contingent upon weather patterns, fuel conditions, and timing of implementation. By reducing vegetation density, thinning some smaller trees and pushing the shrubs back to an early seral stage, ultimately these treatments will be improving prey species habitat quantity and quality for the MSO in the long term. More prey production could have positive effects to MSO and their use of the habitat if they are able to get the food they need in a smaller territory than they are currently having to use to find food.

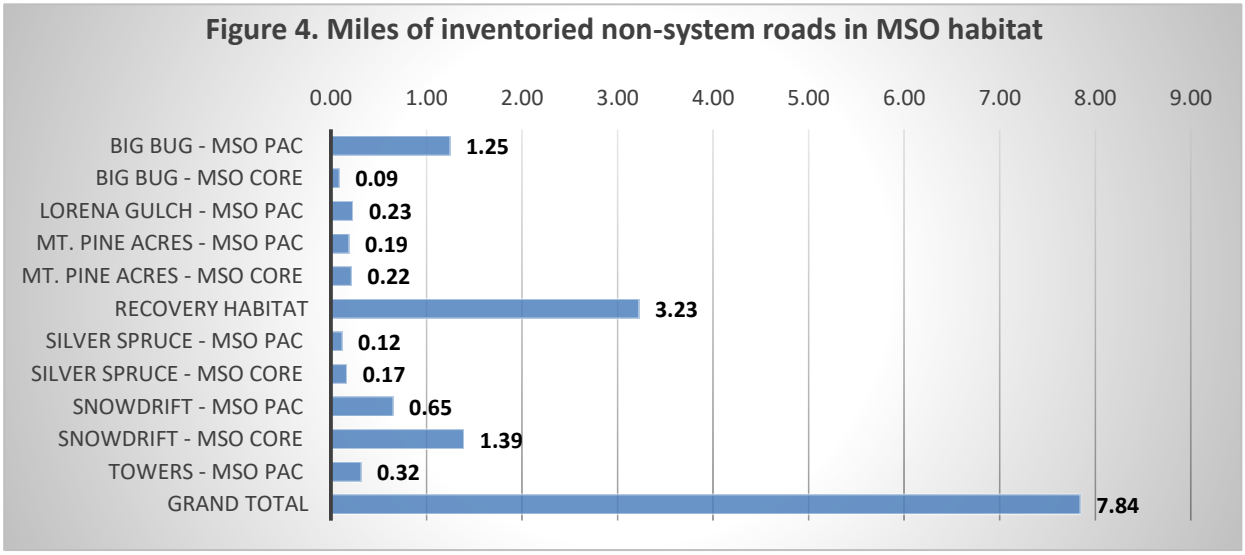
Other effects of fire on the landscape include creating vertical diversity by removing part of the dense understory and opening the stand. Fire can also create openings in the stand providing opportunities for grasses and shrubs as well as pine regeneration, all contributing to horizontal diversity in the stand. These changes in the physical structure of the stand can retain, change and create patch diversity across the

landscape. All of these changes to the vegetation are designed to improve the habitat for the MSO in the long term by retaining or enhancing key habitat variables relevant to the desired conditions for nest/roost habitat for MSO.

Effects of Temporary Roads on MSO

System roads are open for public use. Often the miles can be the result of where and how lines are drawn in GIS. For example, the 1.83 miles of road in the Palace PAC reflects the Senator Highway along the boundary of the PAC. These roads are currently being used by the public and would continue to be used by the public after the treatments are completed.





Public use of non-system roads should not be occurring at this time, would not be allowed during the project implementation, and would effectively be eliminated after implementation through road obliteration. Obliterating non-system roads in MSO habitat would improve the quality of MSO habitat by eliminating disturbance to MSO from unauthorized motorized access.

No new temporary roads would be constructed within any Mexican spotted owl protected activity centers. Old, existing temporary roads and non-system roads may be used as temporary roads within the protected activity centers, if needed. These road prisms would be rehabilitated via road obliteration upon completion of all harvest activities. System roads are currently open to public use. Because the roads are already in place, the roads themselves would not have any impacts to Mexican spotted owl habitat; the effects of the vegetation treatments on the Mexican spotted owl habitat are discussed above.

Designated critical habitat occurs within the project area and is addressed separately below following the analysis of the individual MSO PACs.

Table 16. Summary of projected effects for key habitat variables for MSO PACs relevant to Recovery Plan Table C2. Desired Conditions for MSO PAC							
	Diversity of patch sizes (2.5 ac)	**Horizontal and vertical heterogeneity**	**Tree species diversity – hardwoods and shade-tolerant**	**Diverse composition of herbaceous and shrub species**	**Opening sizes (0.1-2.5 acres)**	**Minimum canopy cover of 40% P/O, 60% M/C**	**Diversity of tree sizes; 16"+ >50%BA**
Big Bug (PIPO/ QUGA)	Create and develop patch diversity	Create horizontal diversity	Continue pine and oak species with some dry mixed conifer	Create species diversity through openings	Openings would be created	Continue to meet minimum canopy	Create conditions to grow trees >18"dbh
Grapevine (PIPO)	Continue sufficient mix of conifer forest, woodland, chaparral, and riparian habitat	Continue sufficient diversity both horizontally and vertically	Continue sufficient diversity of hardwoods associated with riparian botanical area Some shade-tolerant species present due to lack of fire	Maintain diverse composition of herbaceous and shrub species composition associated with diverse forested, upland, and riparian habitat mix	Retain plenty of openings in the PAC	Continue to meet or exceed minimum canopy levels in conifer vegetation	Create conditions to grow trees >18"dbh
Palace (PIPO/ QUGA)	Create diversity of patch sizes	Develop both dimensions by changing seral stages of vegetation	Dominated by Gambel oak and other hardwoods	Create conditions for herbs and grasses in openings in diverse stand of oak and chaparral shrub species	Create openings in the stand	Continue to lack conifer canopy	Continue to lack due to beetle kill and fire
Venezia (PIPO/ QUGA)	Retain sufficient diversity of patches	Retain sufficient diversity in both directions	Continue sufficient mix of pine and oak species	Continue sufficient mix of oak and shrub species	Retain plenty of openings	Continue range of canopy cover in conifers	Create conditions to grow trees >18"dbh
Silver Spruce (Dry Mixed Conifer)	Create diversity of patch sizes	Create horizontal diversity in stand	Continue sufficient oak component within conifer	Develop herbaceous and shrub component with openings	Openings would be created in the stand	Continue to be dense dry mixed conifer canopy	Maintain stands of large trees
Mtn Pine Acres (Dry Mixed Conifer)	Retain on the east side, create on the west side	Retain on the east side, create on the west side	Pine-oak with dry mixed conifer and aspen – enhanced species diversity	Continue sufficient diversity throughout the PAC	Retain on the east side yes, Create on the west side	Continue to meet or exceed minimum canopy in conifers	Create conditions to grow trees >18"dbh
Snowdrift (Dry Mixed conifer)	Retain on the east side, create on the west side	Retain sufficient horizontal diversity	Create species diversity through openings	Sufficient diversity throughout the PAC	Retain on the east side yes, create on the west side	Continue to meet or exceed minimum canopy in conifers	Maintain stands of large trees

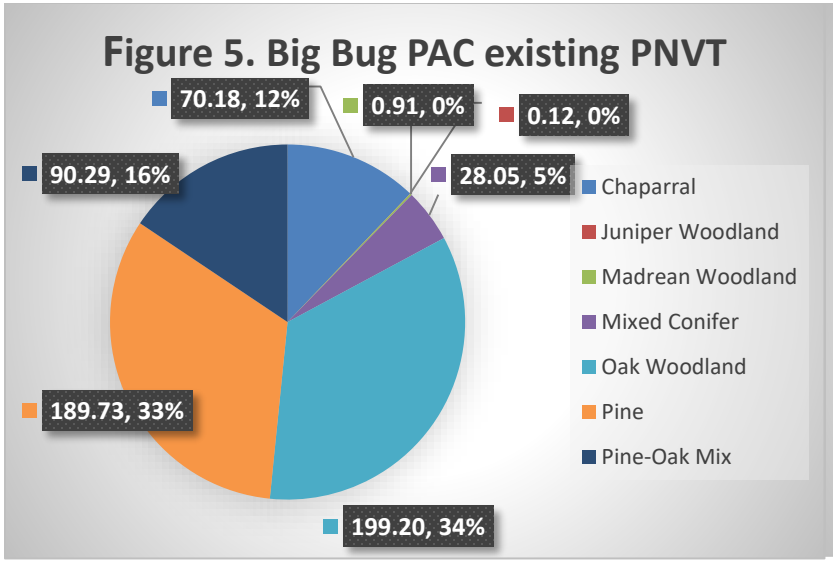
Table 16. Summary of projected effects for key habitat variables for MSO PACs relevant to Recovery Plan Table C2. Desired Conditions for MSO PAC							
	Diversity of patch sizes (2.5 ac)	**Horizontal and vertical heterogeneity**	**Tree species diversity – hardwoods and shade-tolerant**	**Diverse composition of herbaceous and shrub species**	**Opening sizes (0.1-2.5 acres)**	**Minimum canopy cover of 40% P/O, 60% M/C**	**Diversity of tree sizes; 16"+ >50%BA**
Towers (PIPO/ QUGA)	Retain sufficient mosaic of patches of habitat types	Retain sufficient vertical and horizontal diversity	Continue sufficient mix of conifer and hardwood species	Continue sufficient diversity of herbaceous and shrub species associated with openings	Retain openings throughout the PAC	Continue wide range of canopy cover	Core has sufficient trees >18"dbh – Create conditions for developing large trees in PAC
Lorena (PIPO/ QUGA)	Retain sufficient mosaic of patches of habitat types	Retain sufficient vertical and horizontal diversity	Continue pine, oak, and woodland species with some dry mixed conifer	Continue sufficient diversity of herbaceous and shrub species associated with openings	Continue lots of openings in the PAC	Continue to not meet this due to two fires in the PAC	Continue to be low on trees >18"dbh
Highland Pines – No stand exam for this PAC (76 acres - 1/6 of PAC in project area)	Retain sufficient mosaic of patches of habitat types	Retain sufficient vertical and horizontal diversity	Continue sufficient mix of conifer and oaks	Create diversity with openings in oak and shrubs	Openings throughout portion in project area	Unknown	unknown
Tritle (Dry Mixed conifer)	Tritle PAC has been occupied on and off by a pair until 2014 (Table 10). Most of the 10 acres to be treated in this PAC and core are fuel breaks in dry mixed conifer habitat (Map 36). Where available, the fuel breaks in dry mixed conifer will maintain the 60% canopy cover minimum. Treatments in this PAC could impact a pair of MSO.						
Payoff (PIPO/ QUGA)	Thinning the 3 acres of habitat along the boundary of the PAC would not be expected to have a discernible impact on MSO use of the habitat. Non-nesting owls could be disturbed or displaced if thinning is done during the breeding season. The breeding season timing restriction with the ¼ mile buffer will protect any MSO using the PAC during the breeding season. This PAC has been occupied by a pair 3 of the last 5 years (Table 10) Smoke from adjacent prescribed burns could impact nesting MSO in this PAC. Treatments in this PAC could impact a pair of owls.						

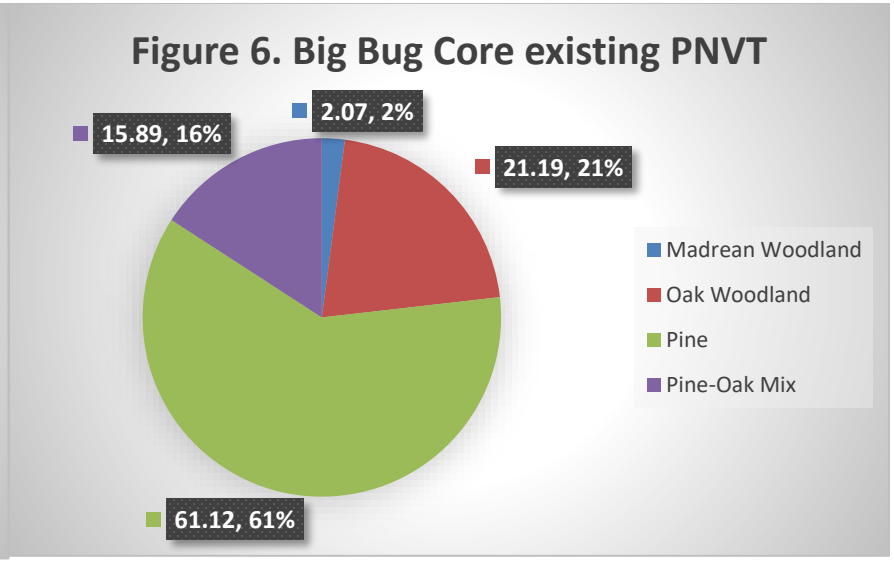
Summary of Effects

Both the existing vegetation types and the types and amounts of proposed treatments, by protected activity center and core, are shown in the following graphs. The analyses above apply to all of the MSO PACs in the project area. Discussions below will be limited to those treatments or situations that are unique to the individual PACs. The table with the data for the following graphs is Table 23 in Appendix C.

For ease of labelling the crowded axes on the graphs, some abbreviations were used.

- "FB" stands for Fuel Breaks.
- "M" stands for Mastication.
- PNVT stands for Potential Natural Vegetation Type.
- PAC stands for Protected Activity Center.





The Big Bug PAC is unique in that it is one of two MSO PACs on the Prescott NF with dry mixed conifer that does not have dry mixed conifer in the core (Map 5). In attempts to delineate the best 600 acres surrounding known nest and roost sites, other vegetation types are unavoidably included in MSO PAC designation. Hence, this PAC includes chaparral, oak woodland and pure pine stands as well as the expected pine-oak and dry mixed conifer.

Based on the results of FVS models, the thinning treatments would remove excess trees but would not drop the basal area below desired thresholds and would maintain the associated desired canopy cover.

With the location of several private parcels within and adjacent to the PAC (Map 6), 117 acres of PAC and 15 acres of core have proposed fuelbreak construction.

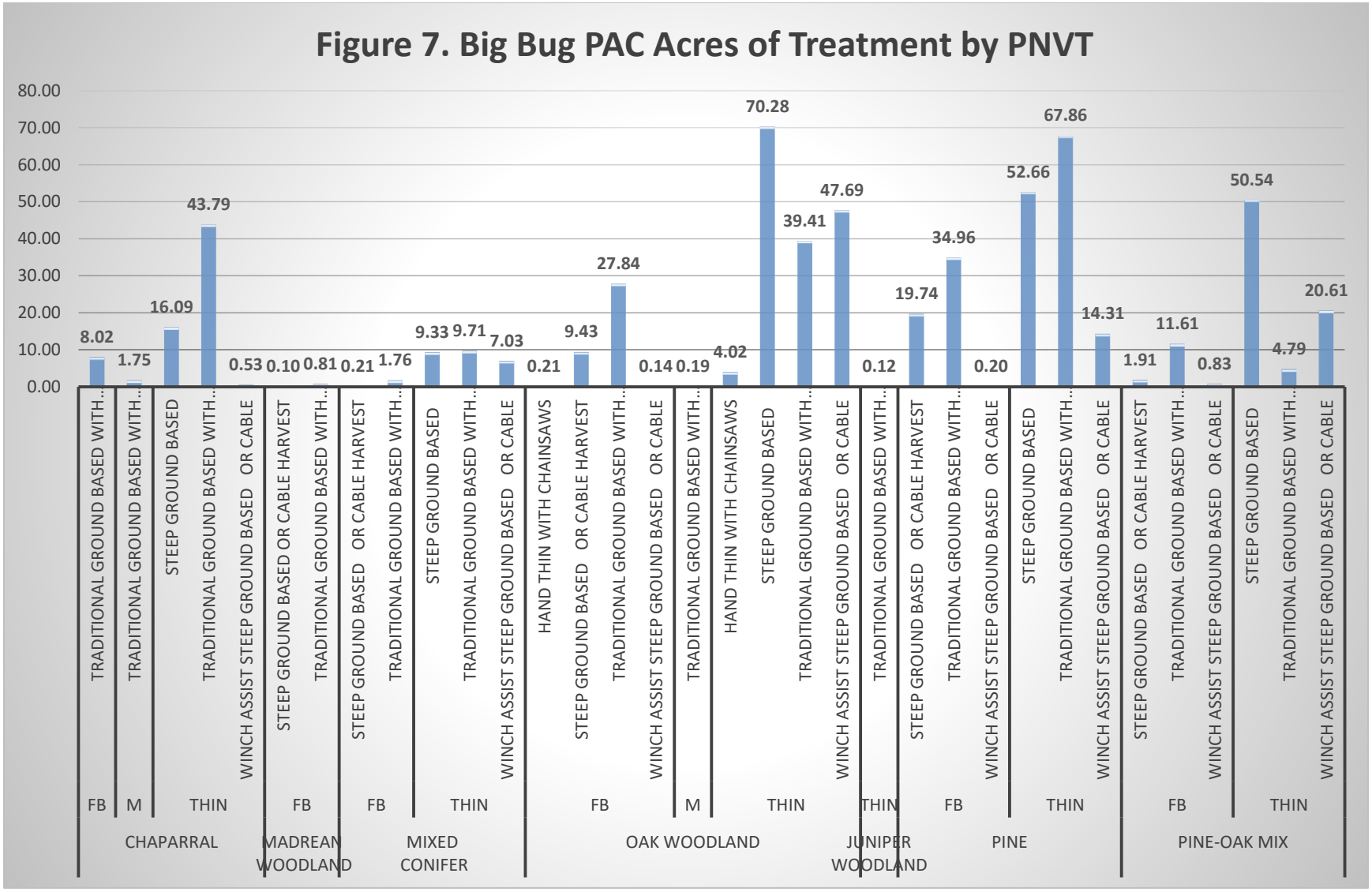


Figure 7. Big Bug PAC Acres of Treatment by PNVT
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
8.02
1.75
16.09
43.79
0.53
0.10
0.81
0.21
1.76
9.33
9.71
7.03
0.21
9.43
27.84
0.14
0.19
4.02
70.28
39.41
47.69
0.12
19.74
34.96
0.20
52.66
67.86
14.31
1.91
11.61
0.83
50.54
4.79
20.61
TRADITIONAL GROUND BASED WITH...
TRADITIONAL GROUND BASED WITH...
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH...
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH...
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
TRADITIONAL GROUND BASED WITH...
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
TRADITIONAL GROUND BASED WITH...
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
FB
M
THIN
FB
FB
THIN
FB
M
THIN
THIN
FB
THIN
FB
THIN
CHAPARRAL
MADREAN WOODLAND
MIXED CONIFER
OAK WOODLAND
JUNIPER WOODLAND
PINE
PINE-OAK MIX

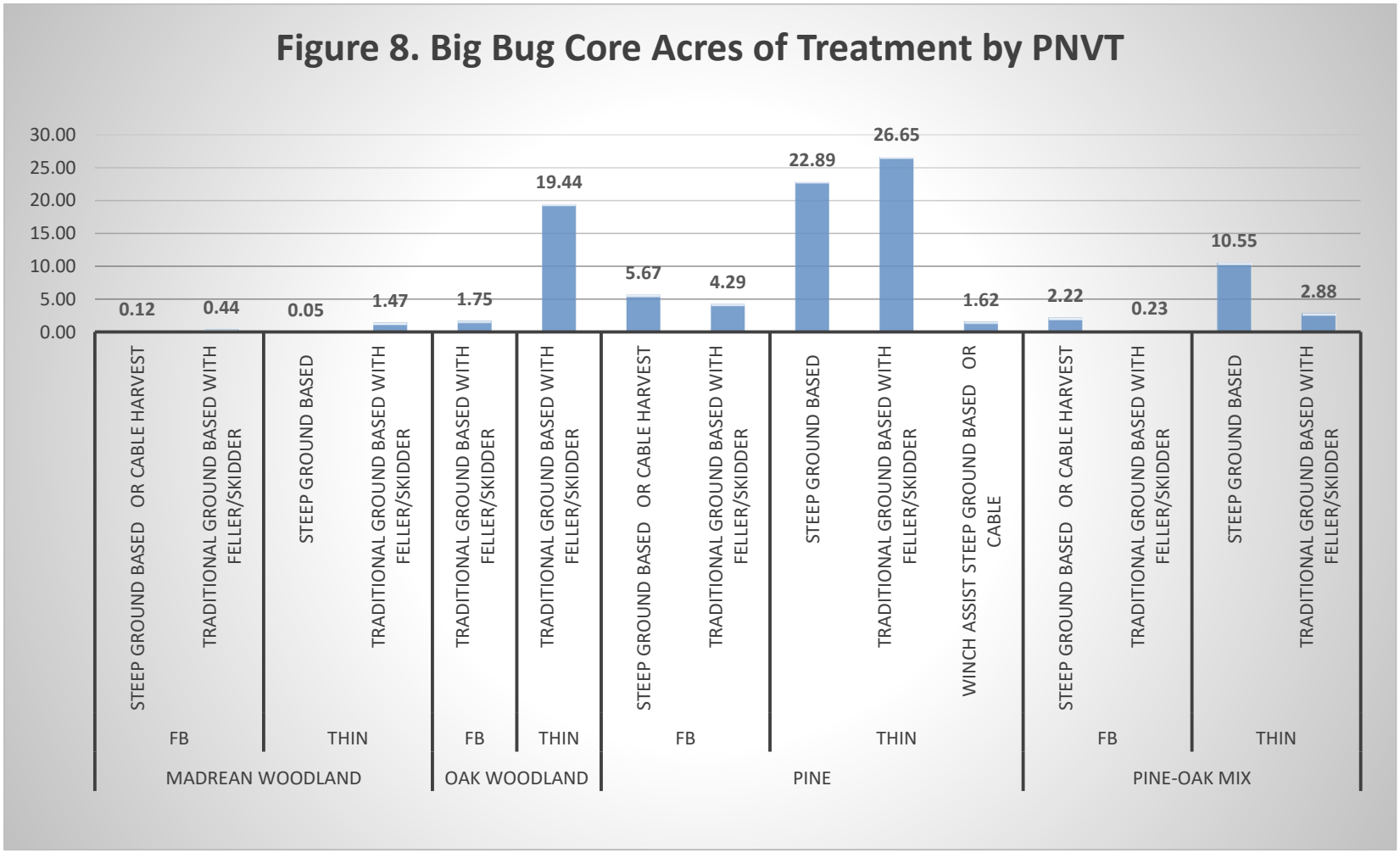
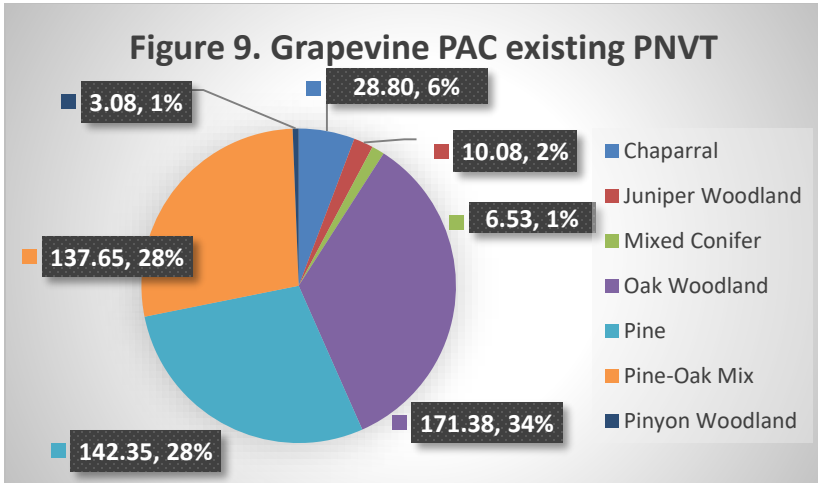
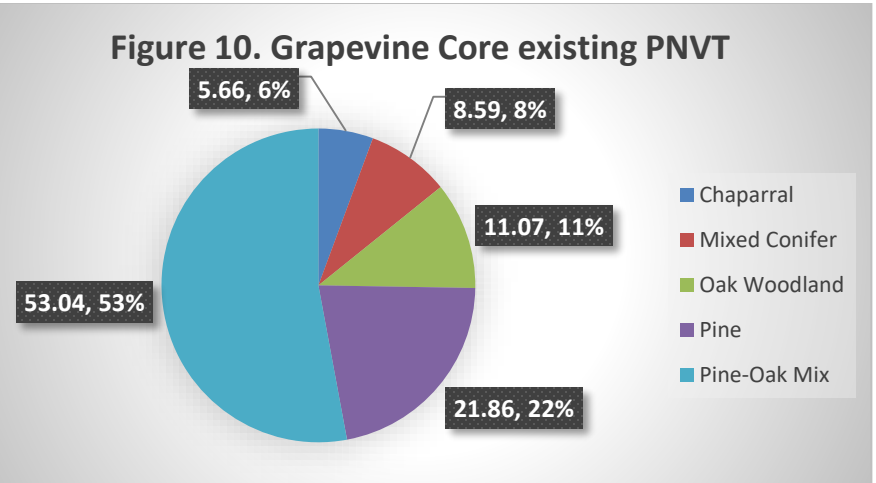
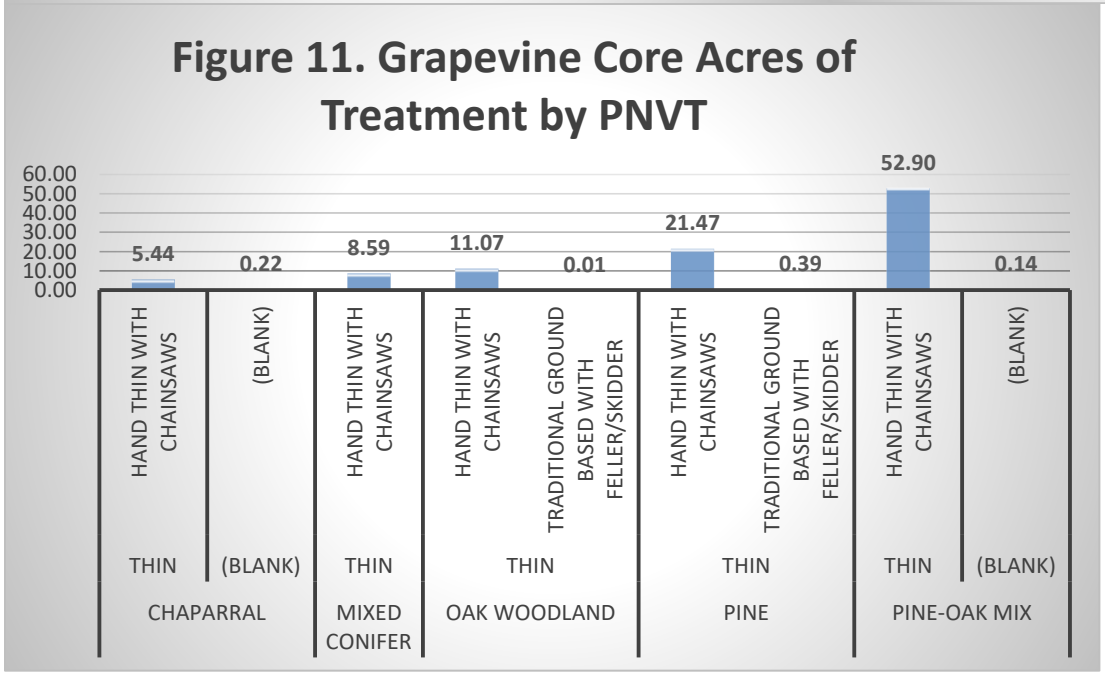


Figure 8. Big Bug Core Acres of Treatment by PNVT
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0.12
0.44
0.05
1.47
1.75
19.44
5.67
4.29
22.89
26.65
1.62
2.22
0.23
10.55
2.88
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
WINCH ASSIST STEEP GROUND BASED OR CABLE
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
FB
THIN
FB
THIN
FB
THIN
FB
THIN
MADREAN WOODLAND
OAK WOODLAND
PINE
PINE-OAK MIX







Grapevine is one of the more recently established PACs on the Prescott and has been occupied by a pair with young in recent years (Table 10). Grapevine core would not experience mechanical treatments despite the mapping exercise due to inaccessibility and steep slopes. Only hand thinning and prescribed fire would occur in this core. There is an opportunity to capitalize on the beneficial effects of the Goodwin Fire to continue to reduce the risk of stand-replacing fire within this PAC. Hand thinning would remove smaller understory trees and reduce the potential for fire getting into the crowns of this PAC. The unique diverse array of habitats (Map 8) would continue to provide high quality habitat for MSO nest/roost and foraging. Some mechanical thinning may occur in flatter areas on top of Big Bug Mesa in various vegetation types within the PAC. Some fuel break construction may be implemented in the PAC adjacent to private land (Map 9).

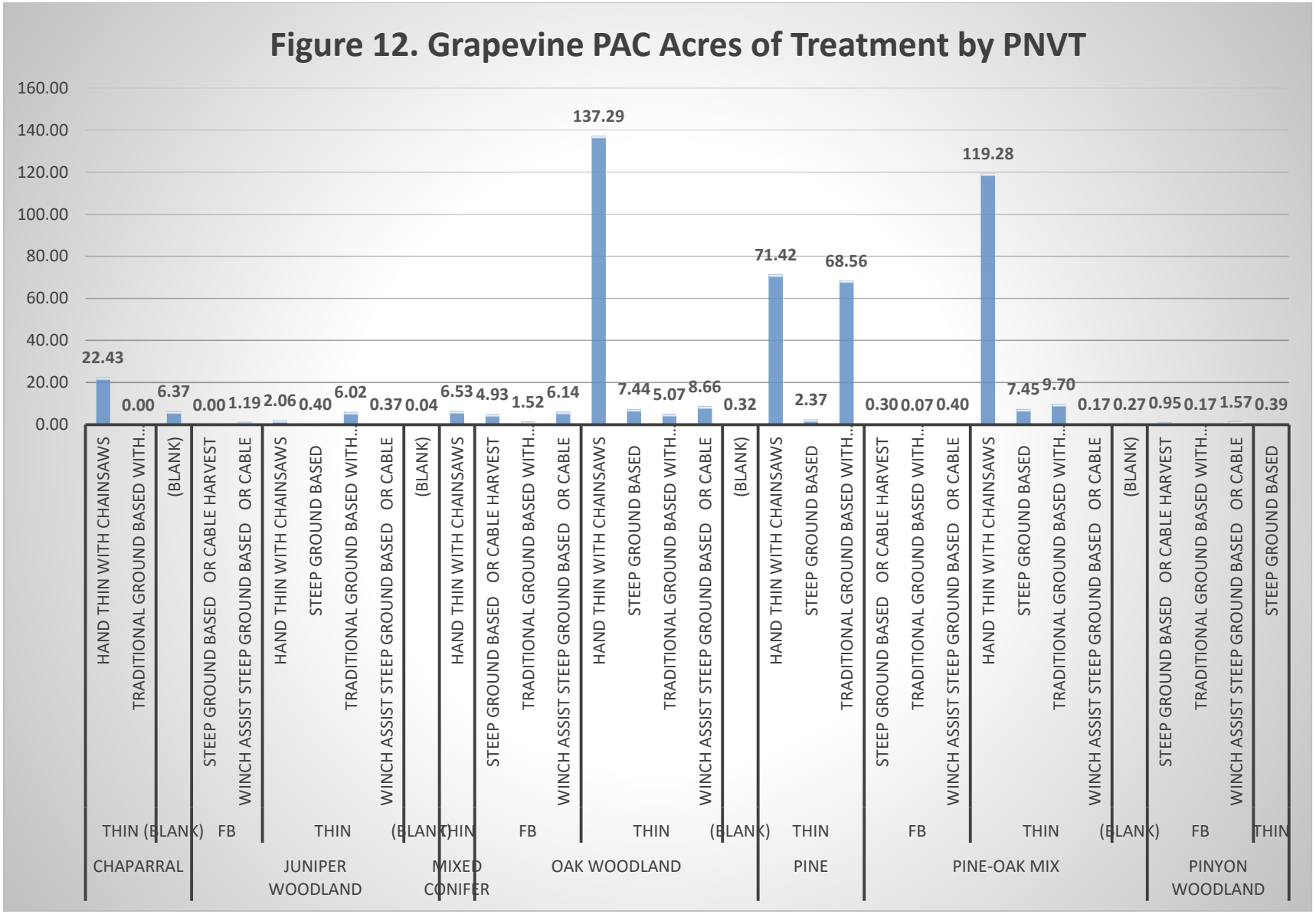


Figure 12. Grapevine PAC Acres of Treatment by PNVT
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
22.43
0.00
6.37
0.00
1.19
2.06
0.40
6.02
0.37
0.04
6.53
4.93
1.52
6.14
137.29
7.44
5.07
8.66
0.32
71.42
2.37
68.56
0.30
0.07
0.40
119.28
7.45
9.70
0.17
0.27
0.95
0.17
1.57
0.39
HAND THIN WITH CHAINSAWS
TRADITIONAL GROUND BASED WITH...
(BLANK)
STEEP GROUND BASED OR CABLE HARVEST
WINCH ASSIST STEEP GROUND BASED OR CABLE
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
(BLANK)
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
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STEEP GROUND BASED OR CABLE HARVEST
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HAND THIN WITH CHAINSAWS
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
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(BLANK)
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR CABLE
STEEP GROUND BASED
THIN (BLANK) FB THIN (BLANK) THIN FB THIN (BLANK) THIN FB THIN (BLANK) FB THIN
CHAPARRAL
JUNIPER WOODLAND
MIXED CONIFER
OAK WOODLAND
PINE
PINE-OAK MIX
PINYON WOODLAND

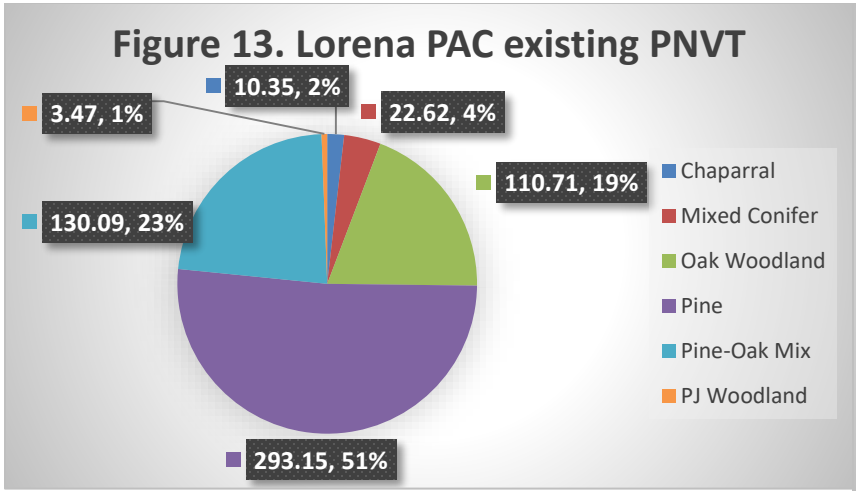


Figure 13. Lorena PAC existing PNVT
10.35, 2%
3.47, 1%
22.62, 4%
110.71, 19%
130.09, 23%
293.15, 51%
Chaparral
Mixed Conifer
Oak Woodland
Pine
Pine-Oak Mix
PJ Woodland

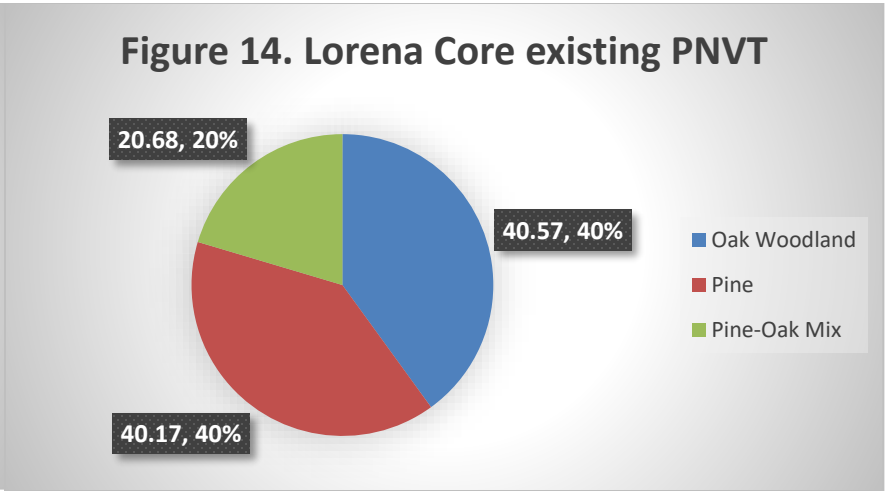


Figure 14. Lorena Core existing PNVT
20.68, 20%
40.57, 40%
40.17, 40%
Oak Woodland
Pine
Pine-Oak Mix

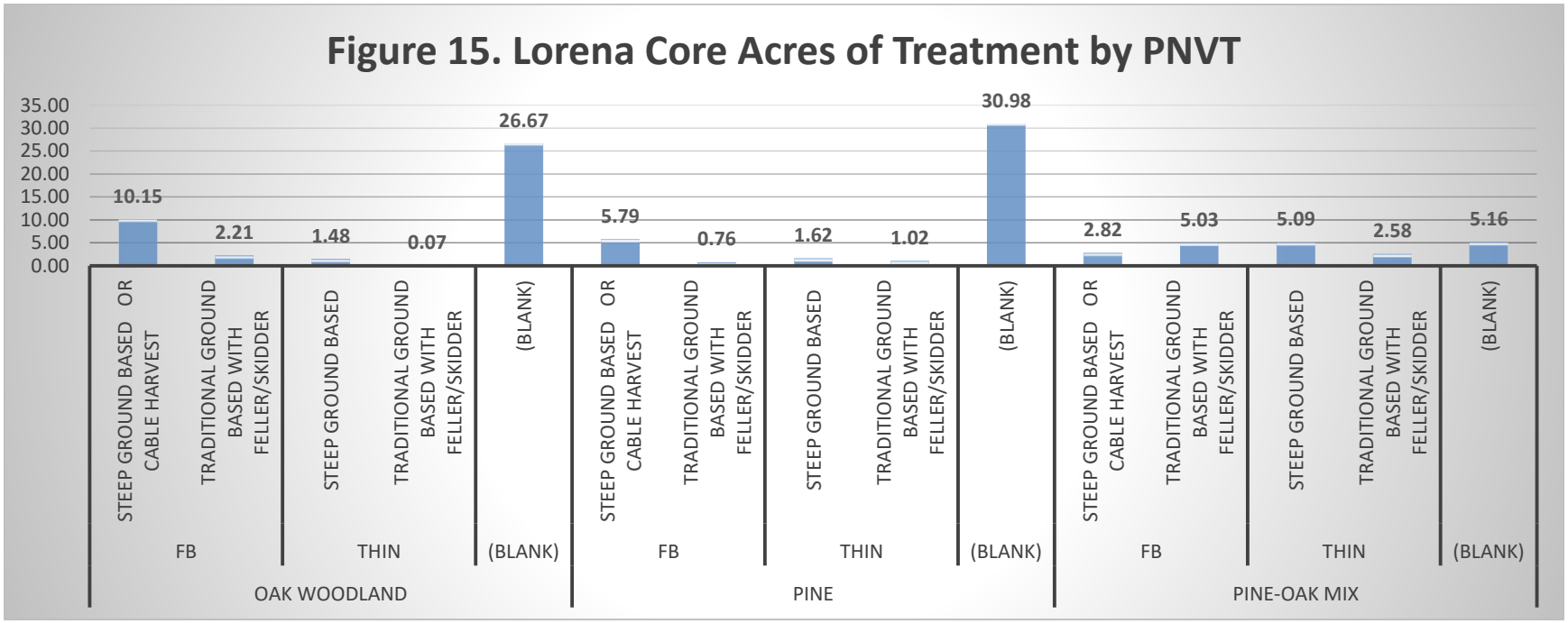
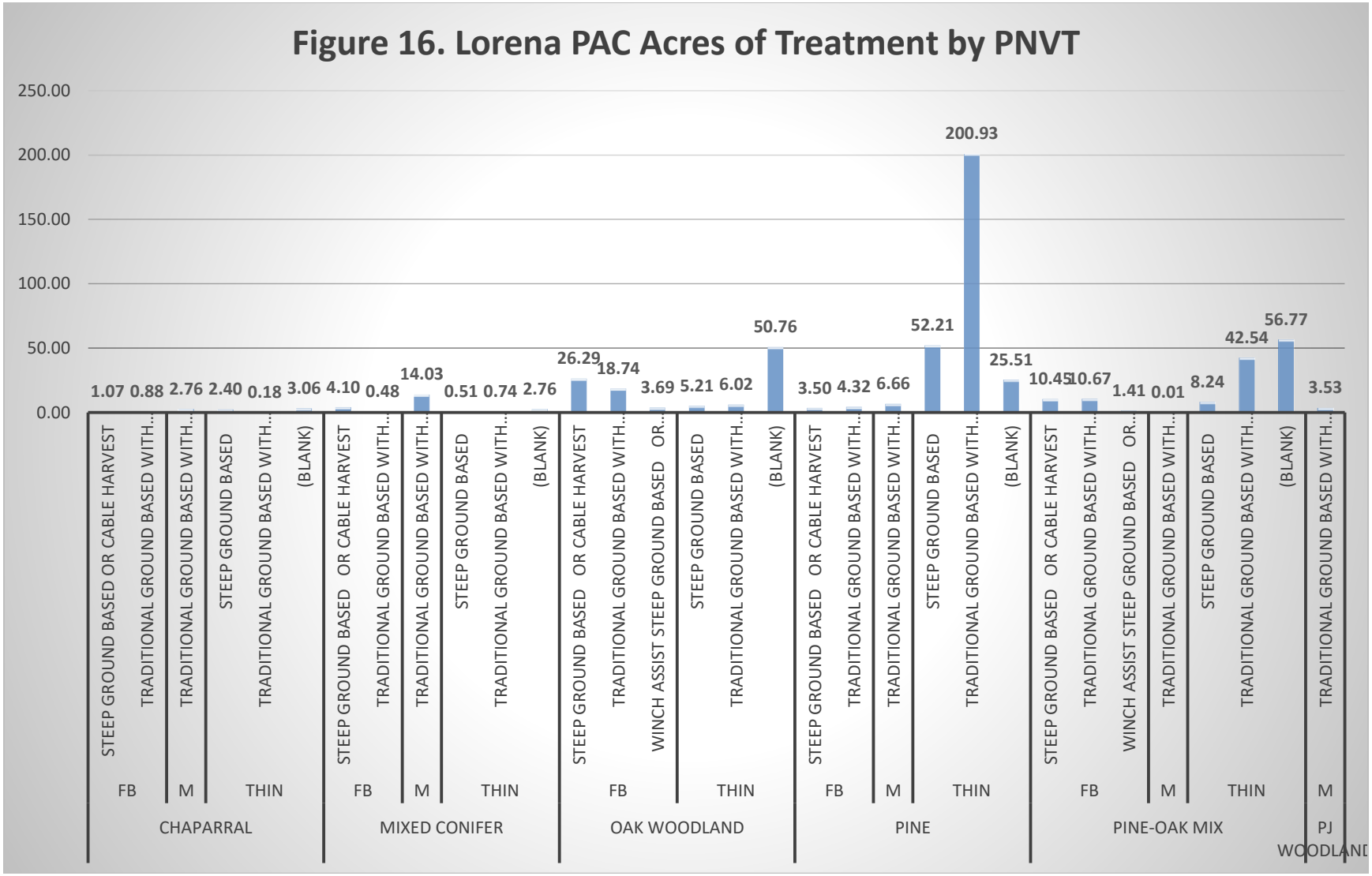


Figure 15. Lorena Core Acres of Treatment by PNVT
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
10.15
2.21
1.48
0.07
26.67
5.79
0.76
1.62
1.02
30.98
2.82
5.03
5.09
2.58
5.16
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
(BLANK)
FB
THIN
(BLANK)
OAK WOODLAND
PINE
PINE-OAK MIX



The Lorena PAC is unique in that it is one of two MSO PACs on the Prescott NF with dry mixed conifer that do not have dry mixed conifer in the core (Map 29). With the extent of the overstory removed by the Lane II Fire in 2008, it is not likely that this MSO PAC is still functional. The Lorena PAC will have 85 acres of mechanical fuel break (Map 30), 27 of which would occur in the core. Most of the treatments in pine-oak and dry mixed conifer are traditional ground-based thinning with only some steep ground treatments in oak woodland, pine, and pine-oak. While

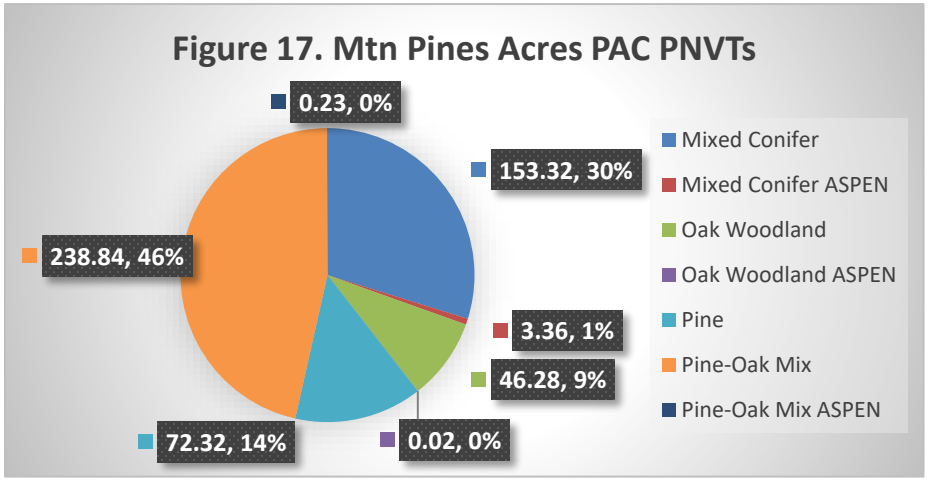
Lorena has much of the desired diversity in patch size, horizontal and vertical diversity, diversity of species, and openings, its lack of overstory inherently results in the lack of canopy cover as well as large trees. Neither of these components can be quickly changed by any of these treatments or are expected to be met in the 20 years of the life of this project.

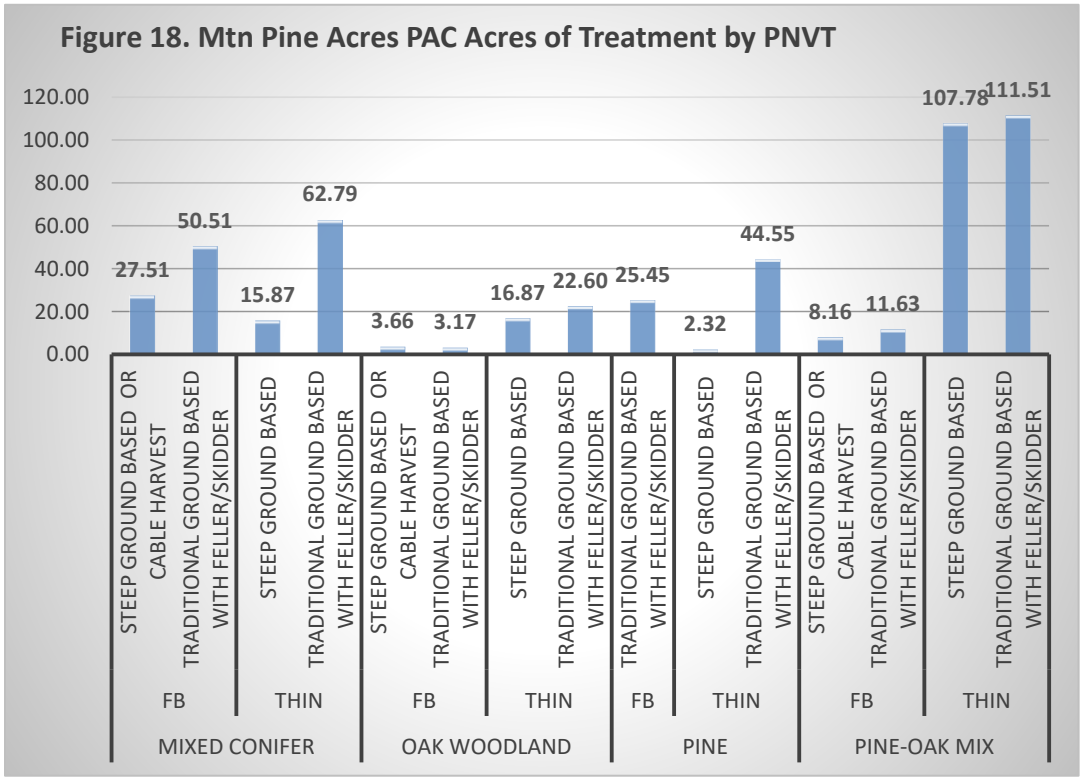
Lorena was last occupied by a pair of MSO in 1994 and then had only had a single female MSO until 2005 (Table 10). The PAC has not been occupied since 2005. Disturbance effects would be expected to occur to a non-nesting single female bird, if any MSO are impacted. Due to the lack of overstory throughout most of the PAC, it is not likely that the territory would be occupied by a pair any time soon.

This is the only PAC that does not have the entire territory proposed for some type of treatment prior to the use of prescribed fire. The effects to the vegetation from the Lane II Fire have prepared this PAC to receive fire without additional vegetation treatments.

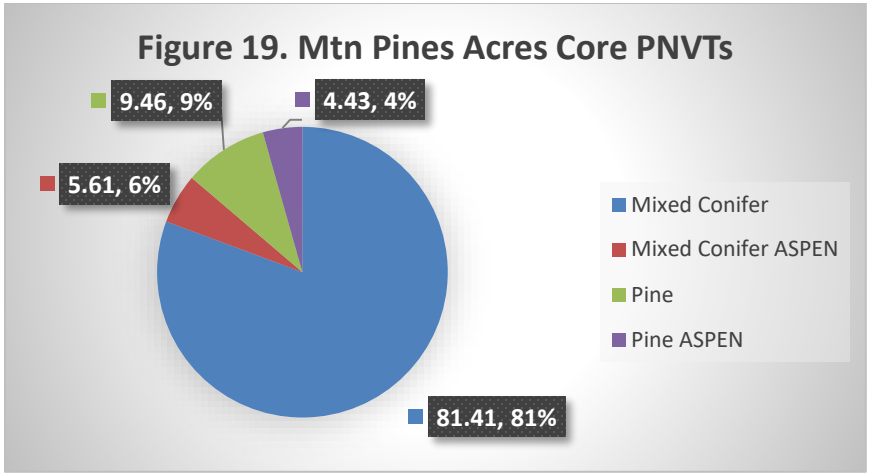
Mountain Pine Acres is one of the most frequently visited MSO PACs on the Prescott National Forest simply by nature of the ease of access and complexity of issues to be discussed. Resource managers often visit with each other and other interested parties to discuss the challenges facing managing MSO habitat in the midst of the WUI (Map 20). This PAC is consistently occupied by a pair or single bird (Table 10).

One of the most unique features of this PAC and core is the presence and proposal to treat aspen in the PAC and the core. The other is the large portion of the PAC and core in dry mixed conifer. The third is the amount of private property surrounding this PAC. Both of the vegetation types will require working closely with FWS to site specifically mark the prescriptions for these treatments. The need for fuel breaks in this area is imperative (Map 21). The combination of adjacent private property and dense stand conditions presents resource managers with immense challenges for protecting both life and property in the wildland urban interface as well as threatened species habitat.

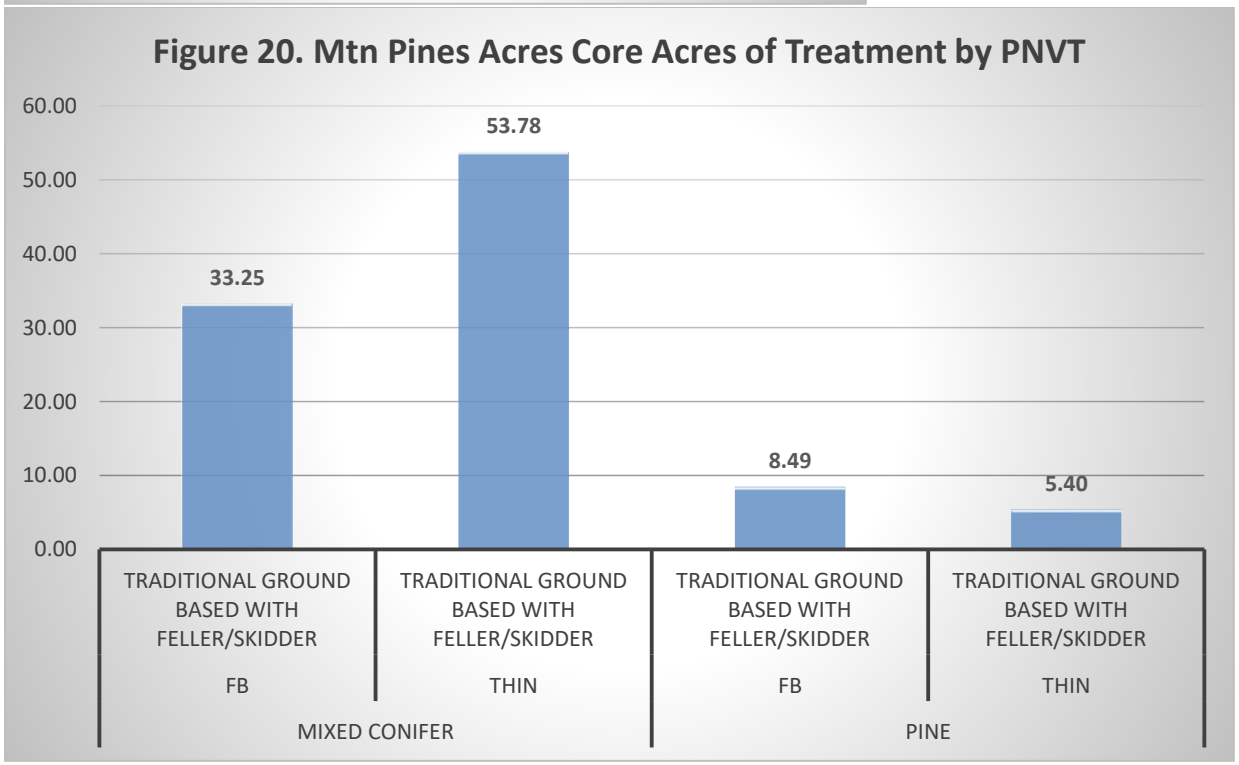


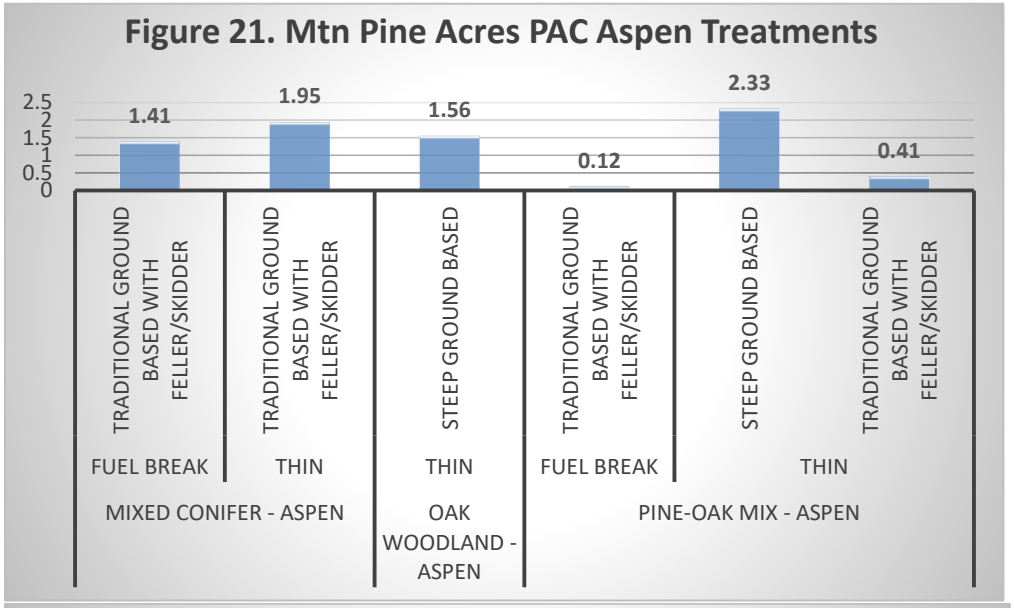


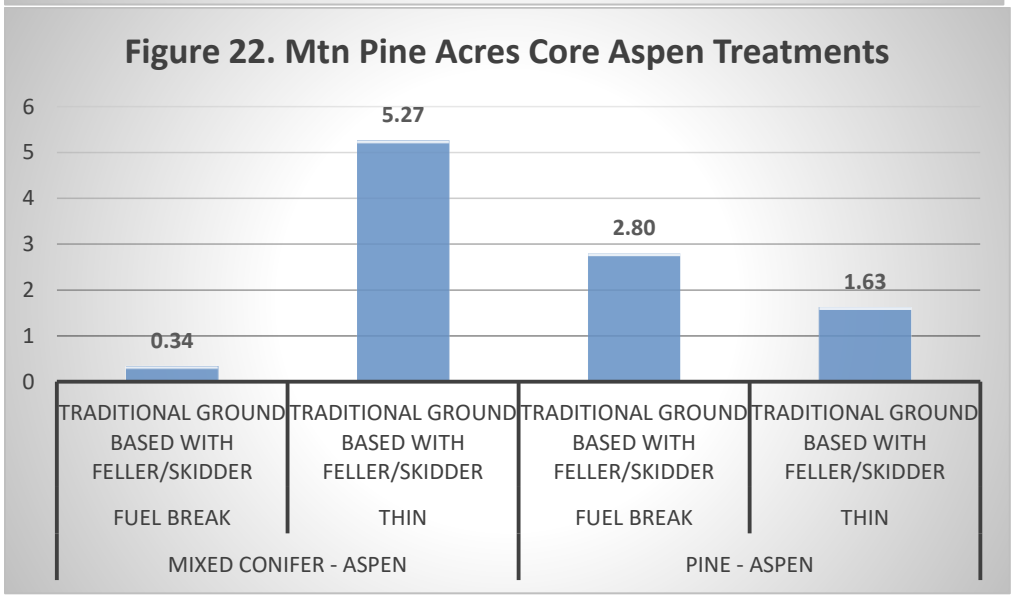
Some considerable changes in the vegetation structure are proposed for this particular MSO PAC. The pair of MSO may be challenged in adapting to those changes in the vegetation. Between fuel breaks, aspen restorations, and thinning dense dry mixed conifer stands to reduce fuel loading and restore forest health, owls may either continue to use the PAC or may choose to move away from the unfamiliar structure of their territory. If the appropriate components are retained, the territory could be acceptable to other owls dispersing from adjacent PACs.



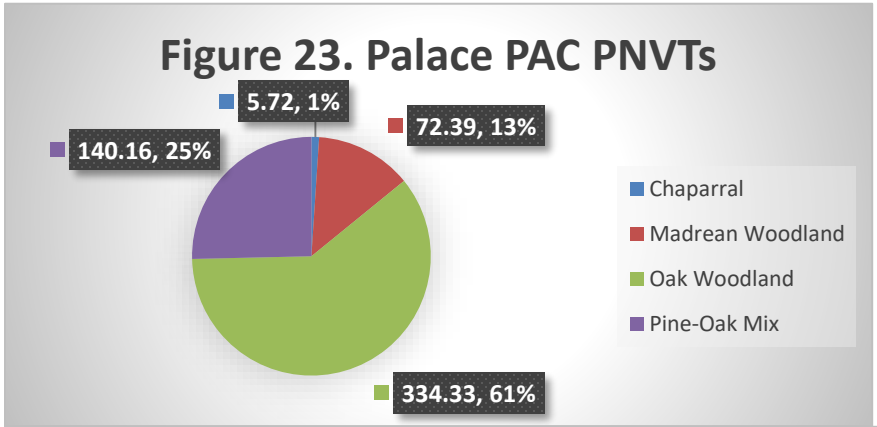
Treating both aspen and mixed conifer vegetation types will be the most challenging parts of managing this particular PAC. The need to reduce the risk of fire and restore a disappearing component of the landscape while meeting desired conditions for nesting/roosting habitat for the MSO seems to conflict in this core.



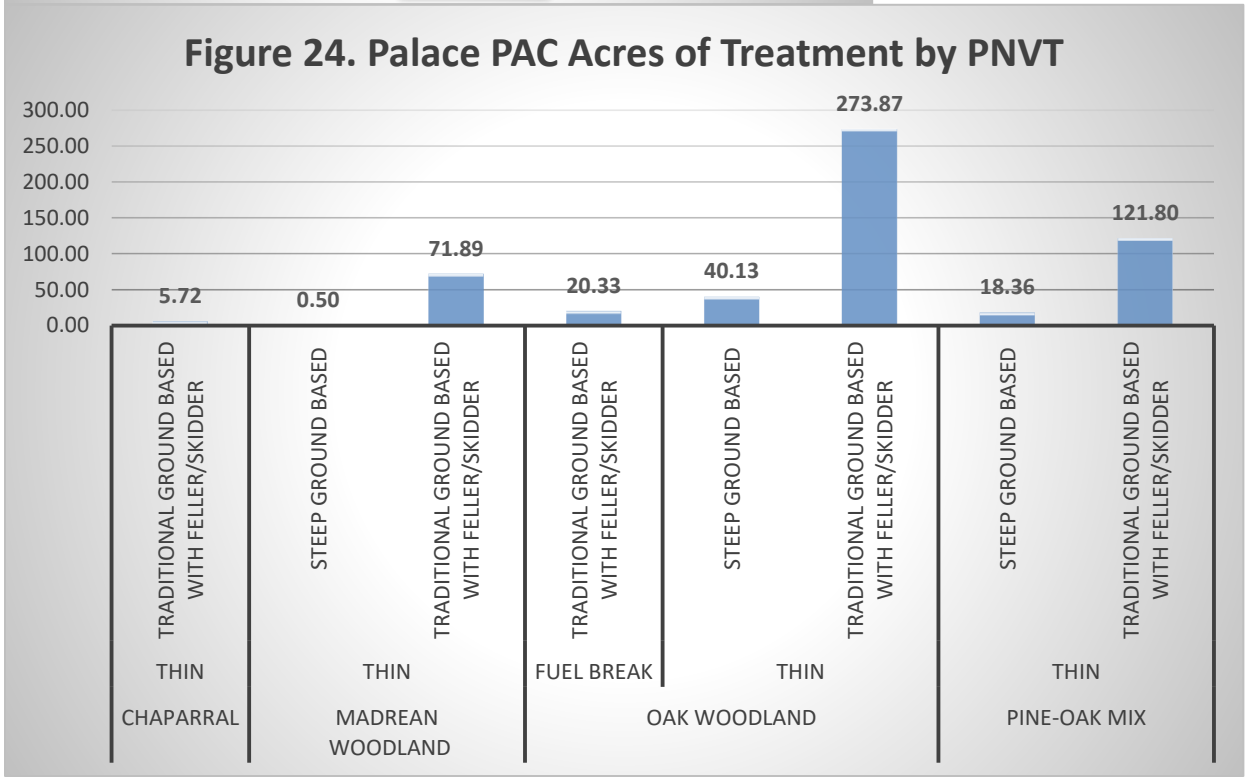


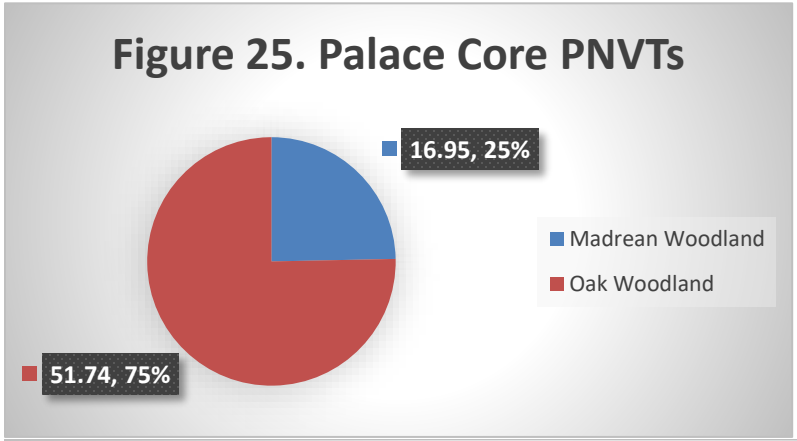


Aspen treatments within this PAC and core are essential if this unique habitat feature is to be salvaged and retained on the landscape. The treatments are designed to retain and improve the aspen stands within this MSO habitat. Enhancing the aspen component within this MSO habitat will provide improved quality foraging habitat for MSO through the diverse bird habitat it provides.

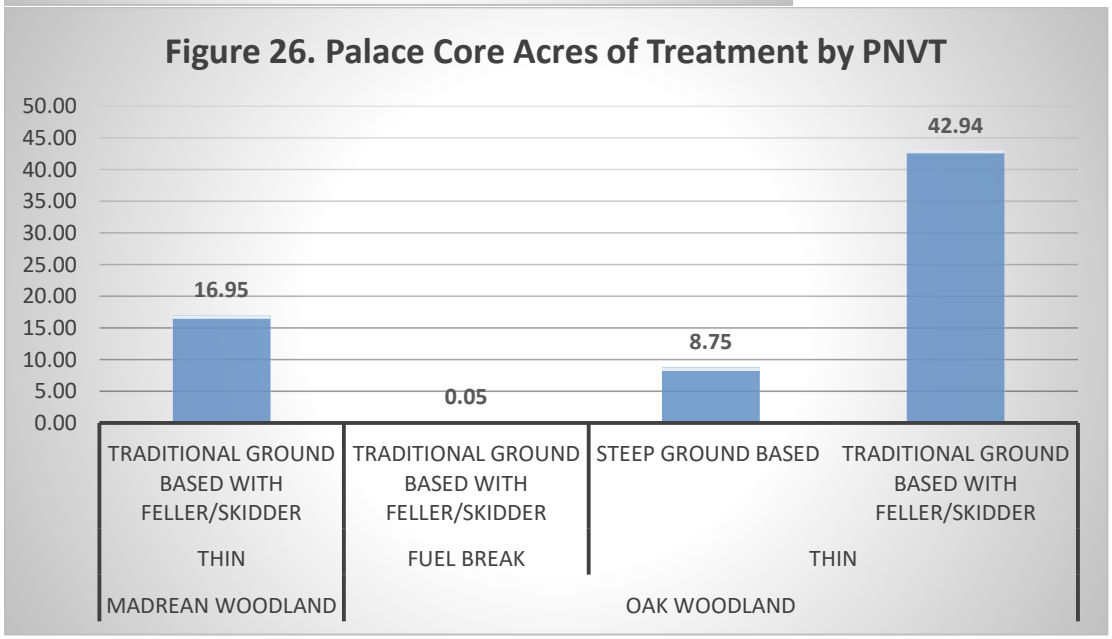


Bark beetle induced tree mortality in 2005/2006 and the subsequent August Fire in October 2007 (Map 11) essentially removed the ponderosa pine overstory within this PAC; therefore this PAC and core are lacking in key variables for MSO nesting/roosting habitat desired conditions. The canopy cover and large trees associated with these will not be developed in the life of this project. It is highly unlikely if this MSO PAC will be functional again.
It is doubtful that any MSO would be impacted by treatments within this PAC or core.





This core no longer has a ponderosa pine overstory. There has not been an owl detected in this PAC since 2001 (Table 10). It is not likely that an MSO would be impacted by vegetation treatments (Map 12) within this core.



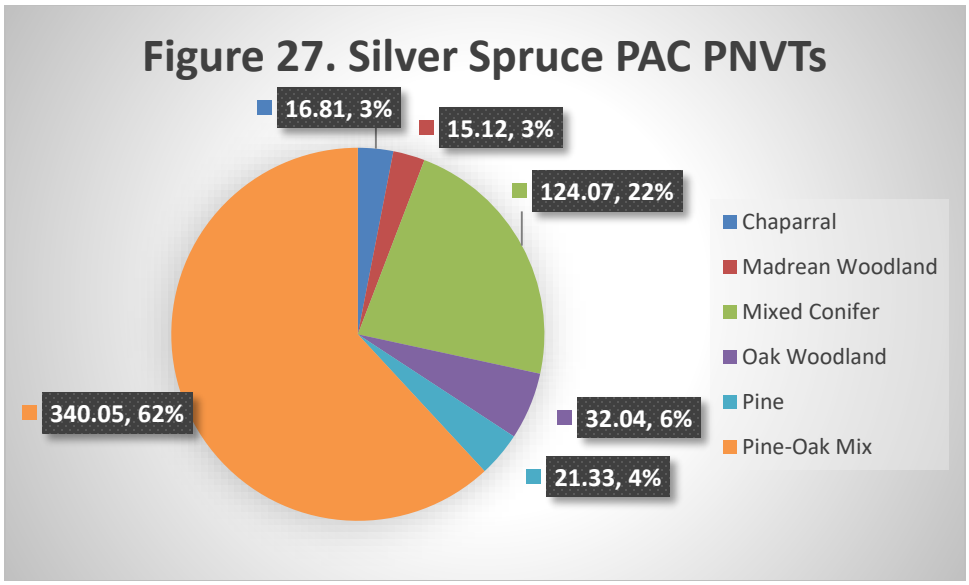


Figure 27. Silver Spruce PAC PNVTs
16.81, 3%
15.12, 3%
124.07, 22%
340.05, 62%
32.04, 6%
21.33, 4%
Chaparral
Madrean Woodland
Mixed Conifer
Oak Woodland
Pine
Pine-Oak Mix

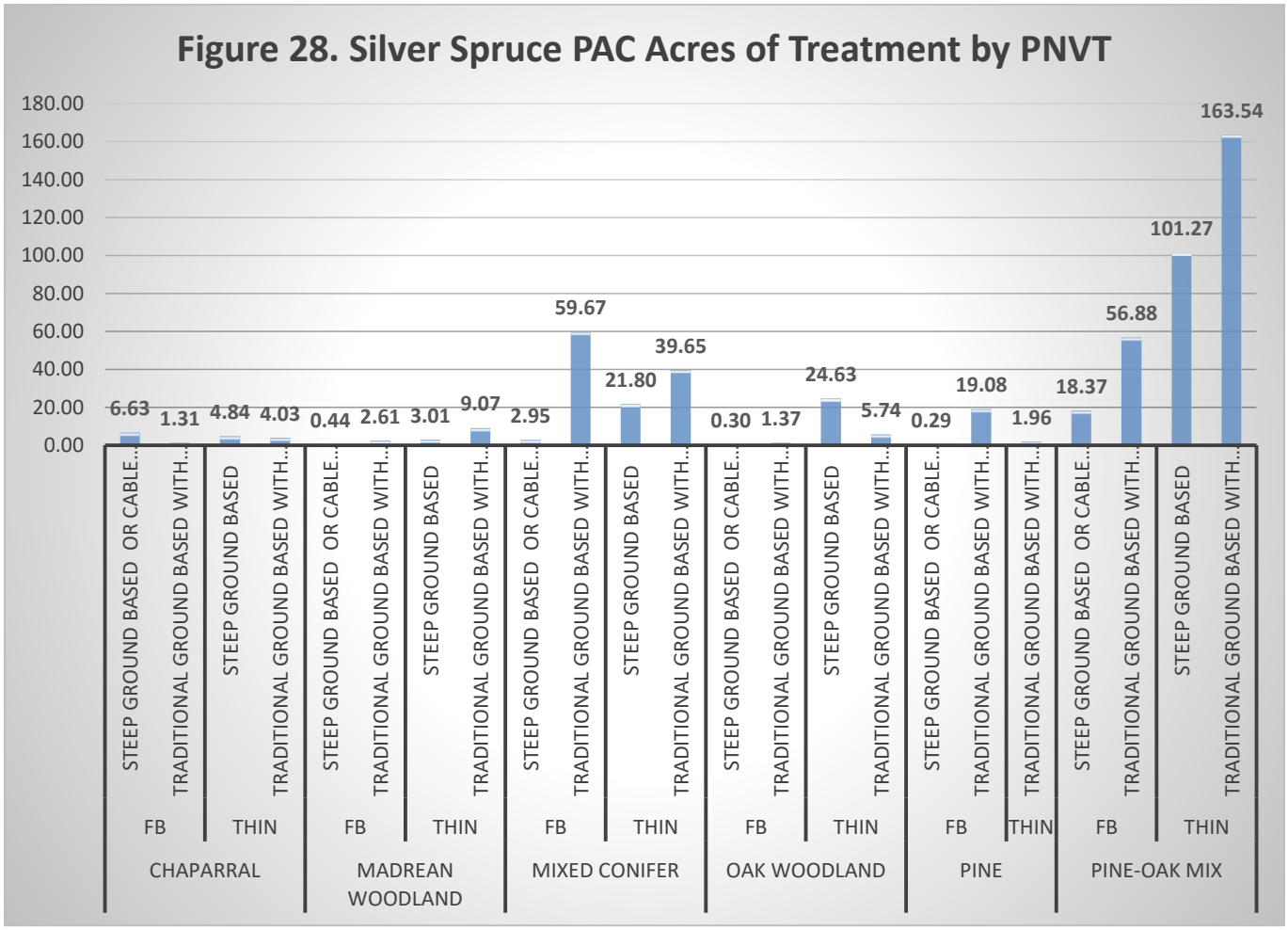
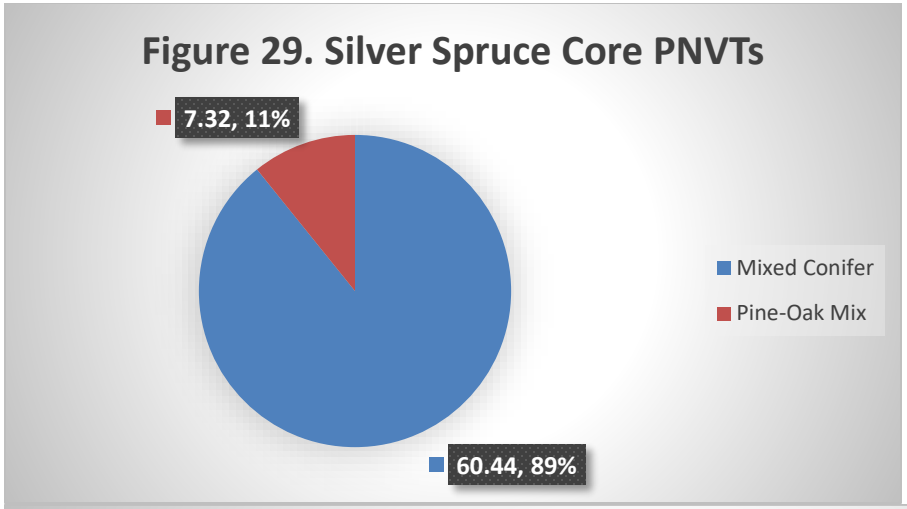
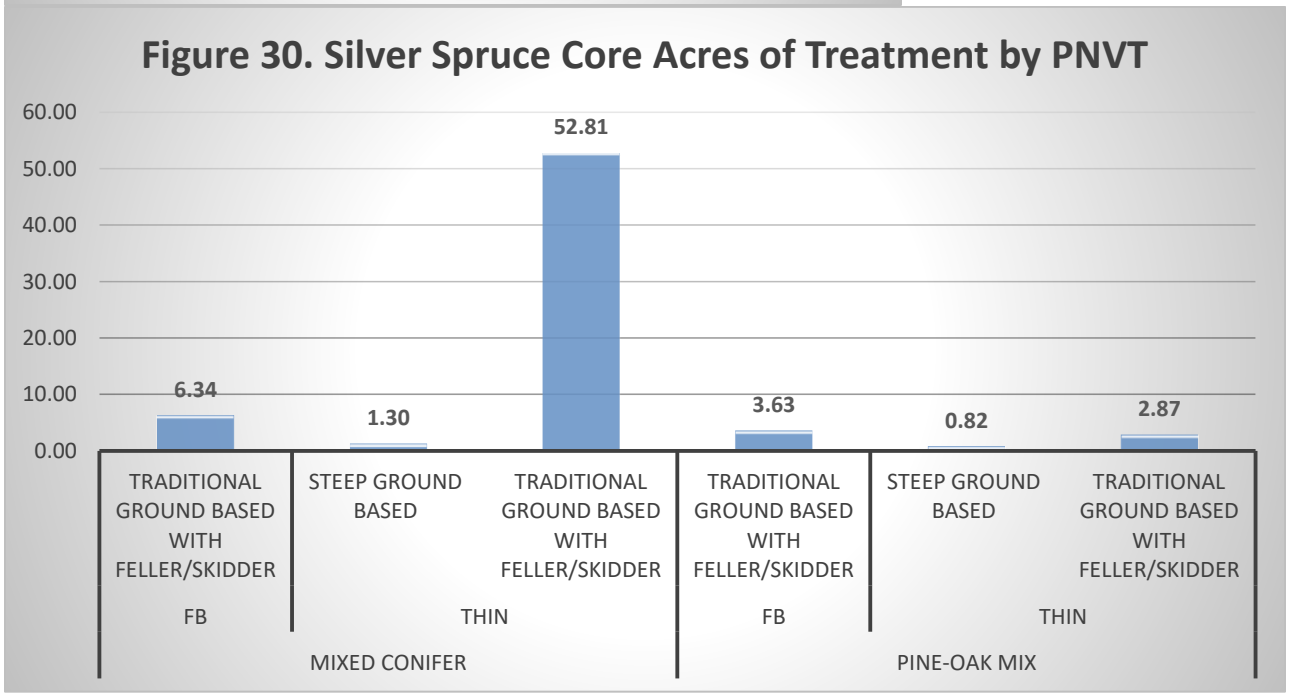


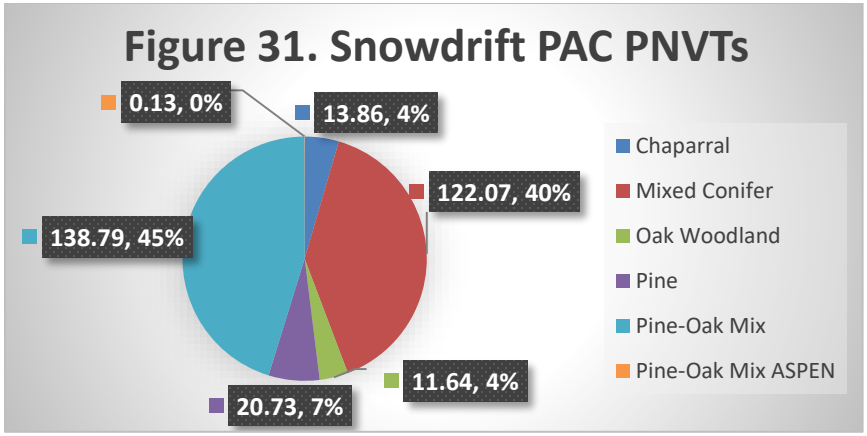
Figure 28. Silver Spruce PAC Acres of Treatment by PNVT
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
6.63
1.31
4.84
4.03
0.44
2.61
3.01
9.07
2.95
59.67
21.80
39.65
0.30
1.37
24.63
5.74
0.29
19.08
1.96
18.37
56.88
101.27
163.54
STEEP GROUND BASED OR CABLE...
TRADITIONAL GROUND BASED WITH...
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
FB
THIN
CHAPARRAL
MADREAN WOODLAND
MIXED CONIFER
OAK WOODLAND
PINE
PINE-OAK MIX



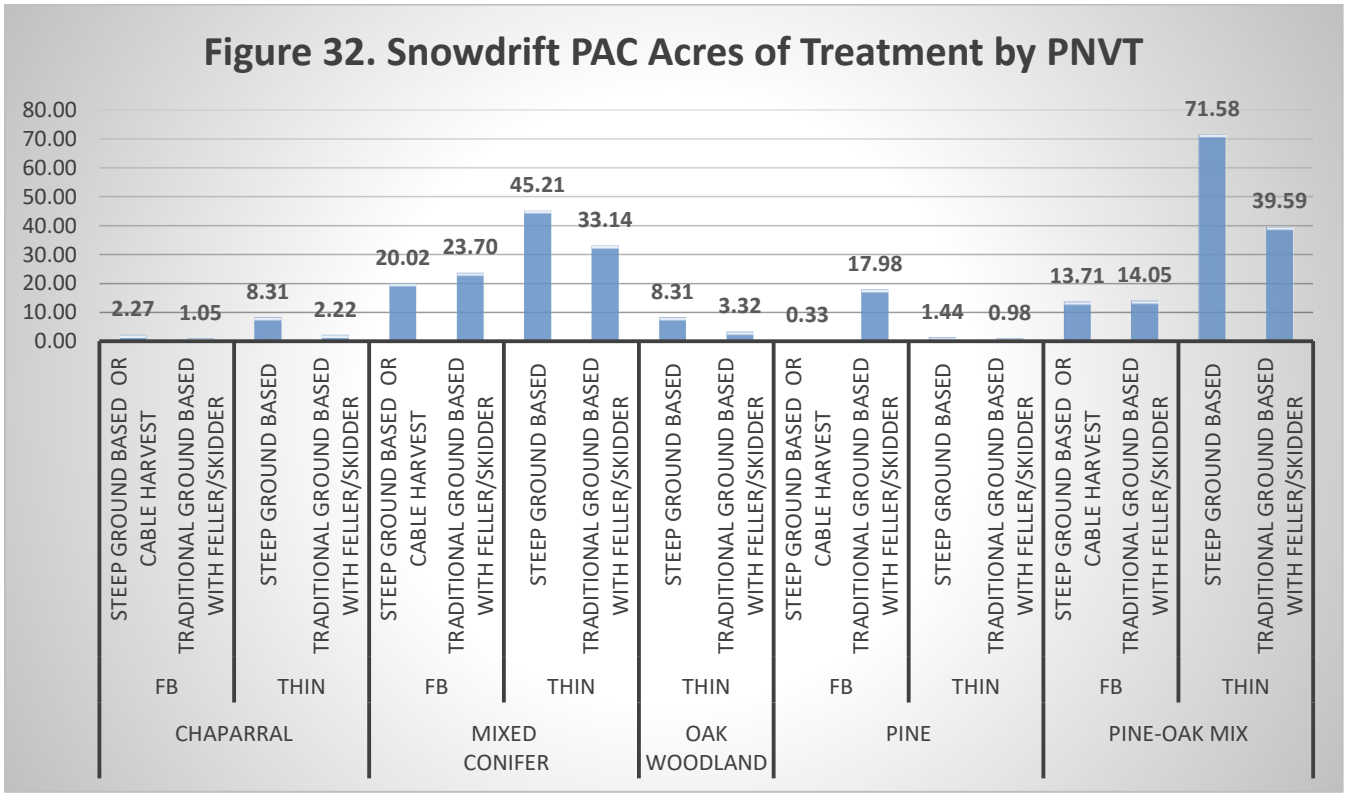
This PAC last had a pair with young in 2015 (Table 10). Recent activities on adjacent private property may be disturbing owls that had been using the PAC (Map 17). Loud singing during the night by multiple individuals has been heard during nighttime MSO surveys. A pair of MSO could be impacted by treatments in this PAC.

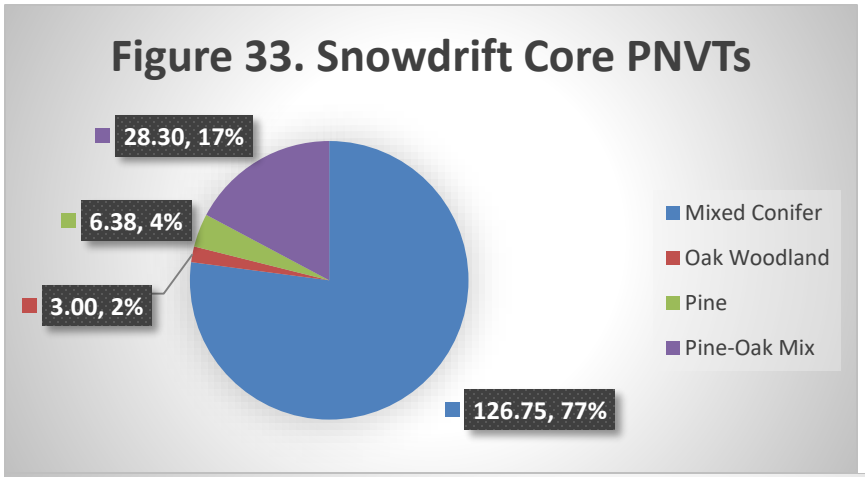
This PAC has tremendous excess of large trees and will benefit from thinning. The desired basal area and canopy cover will be retained after treatments. Treatments will create diversity in most of the key habitat variables for nest/roost habitat that are currently lacking in the existing condition. Treatments (Map 18) will create patch diversity in an otherwise homogenous territory. Openings will provide for plant species diversity in trees, shrubs and grasses, improving MSO prey species habitat.





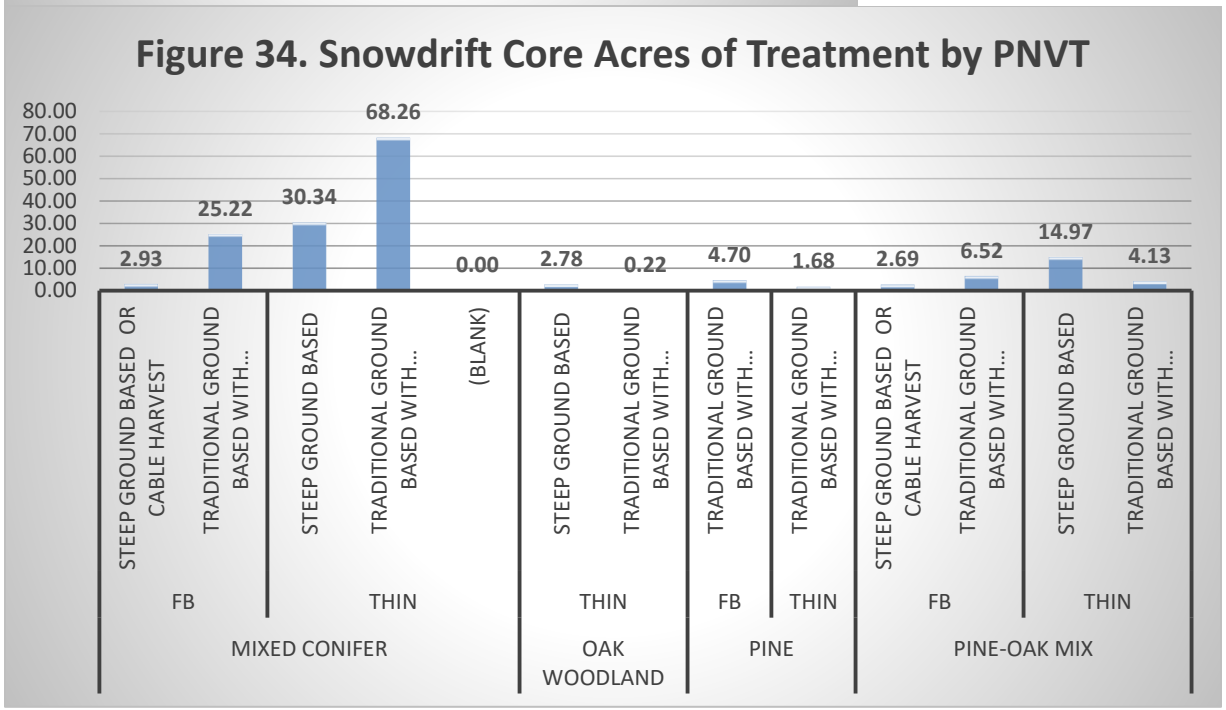
This is yet another PAC with unique circumstances. This PAC has never had documented reproduction (Table 19). Sharing boundaries with private property (Map 23) in dense mixed conifer habitat will require fuelbreak construction in both the PAC and the core. This PAC has all of the key habitat variables for MSO nesting/roosting habitat, even to excess. The dense mixed conifer will continue to have the desired basal area and canopy cover in large trees post-treatment. The other key habitat variables will be retained and enhanced including patch diversity and species composition. Vegetation treatments in the PAC may impact a pair of MSO as they adjust to changes in the vegetation structure of their territory or are displaced outside of the breeding season.



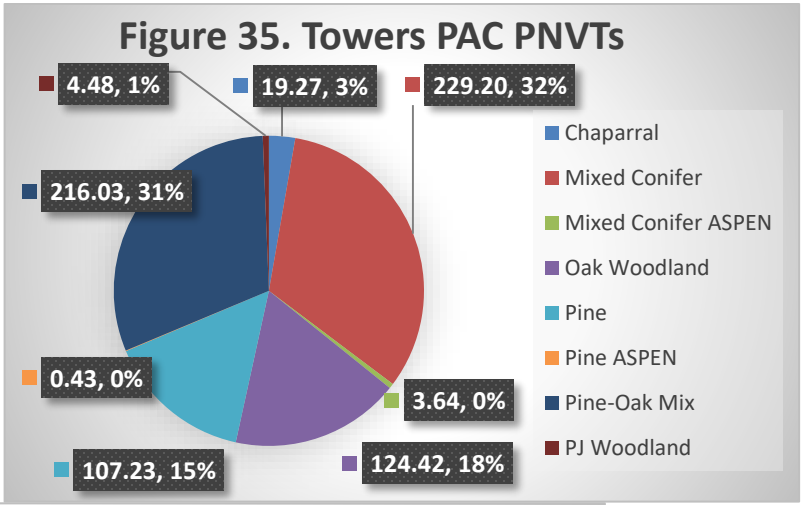


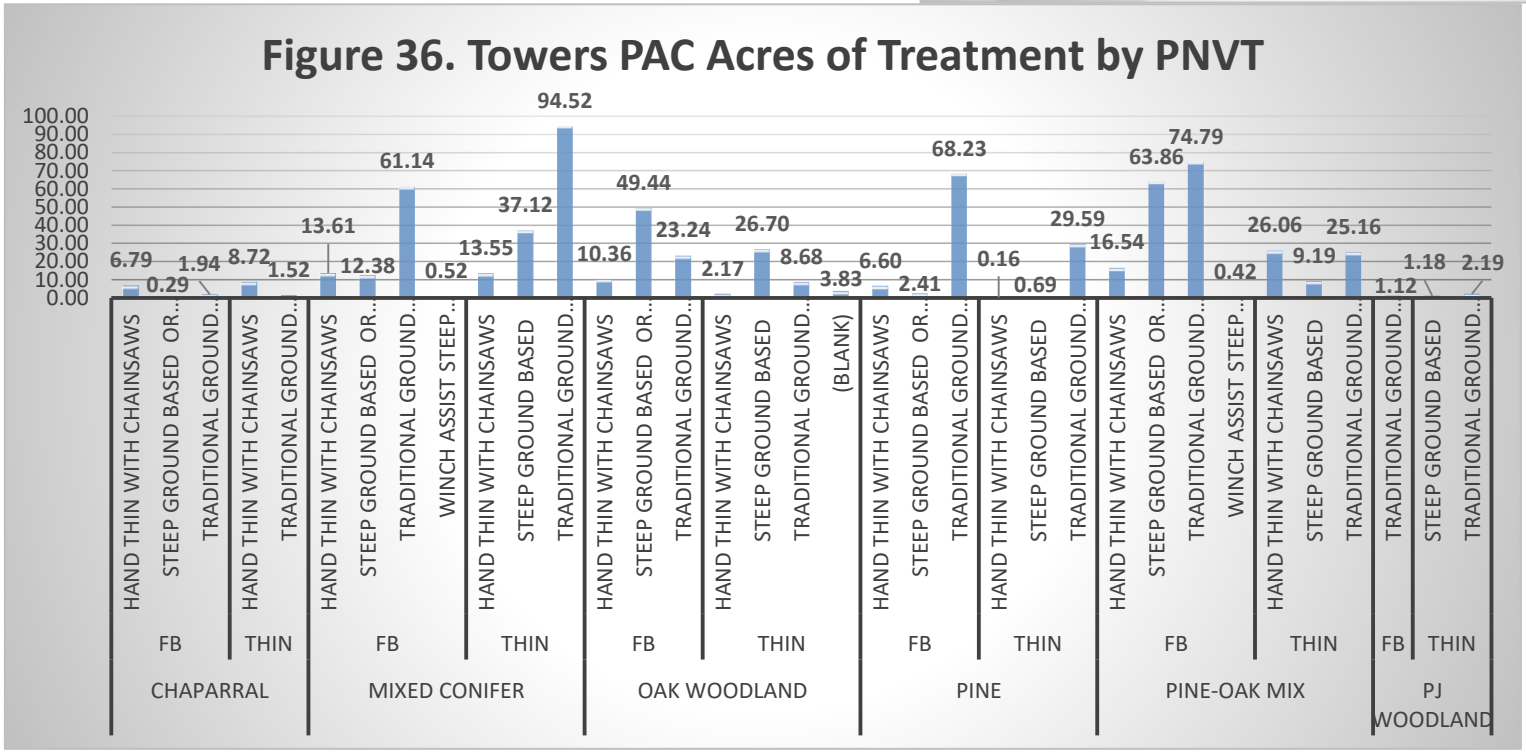
Steep ground-based mechanical thinning would be extensive in this core (Map 24). As stated in the effects above, mechanical thinning on steep ground primarily removes smaller understory trees which is not expected to change the canopy cover below desired minimum levels. The density of large trees would be retained. Small openings created by the thinning would increase diversity of herbaceous and shrubs species and create some horizontal and vertical diversity within the homogenous conifer portions of the PAC.

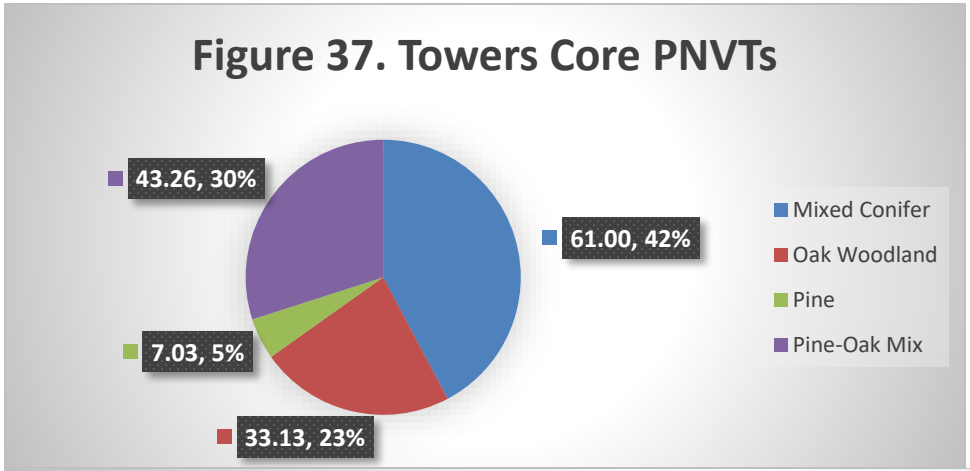
Only part of the PAC lies within the project area (Map 23). The remaining portion is outside of the project area and would not be impacted by these treatments.



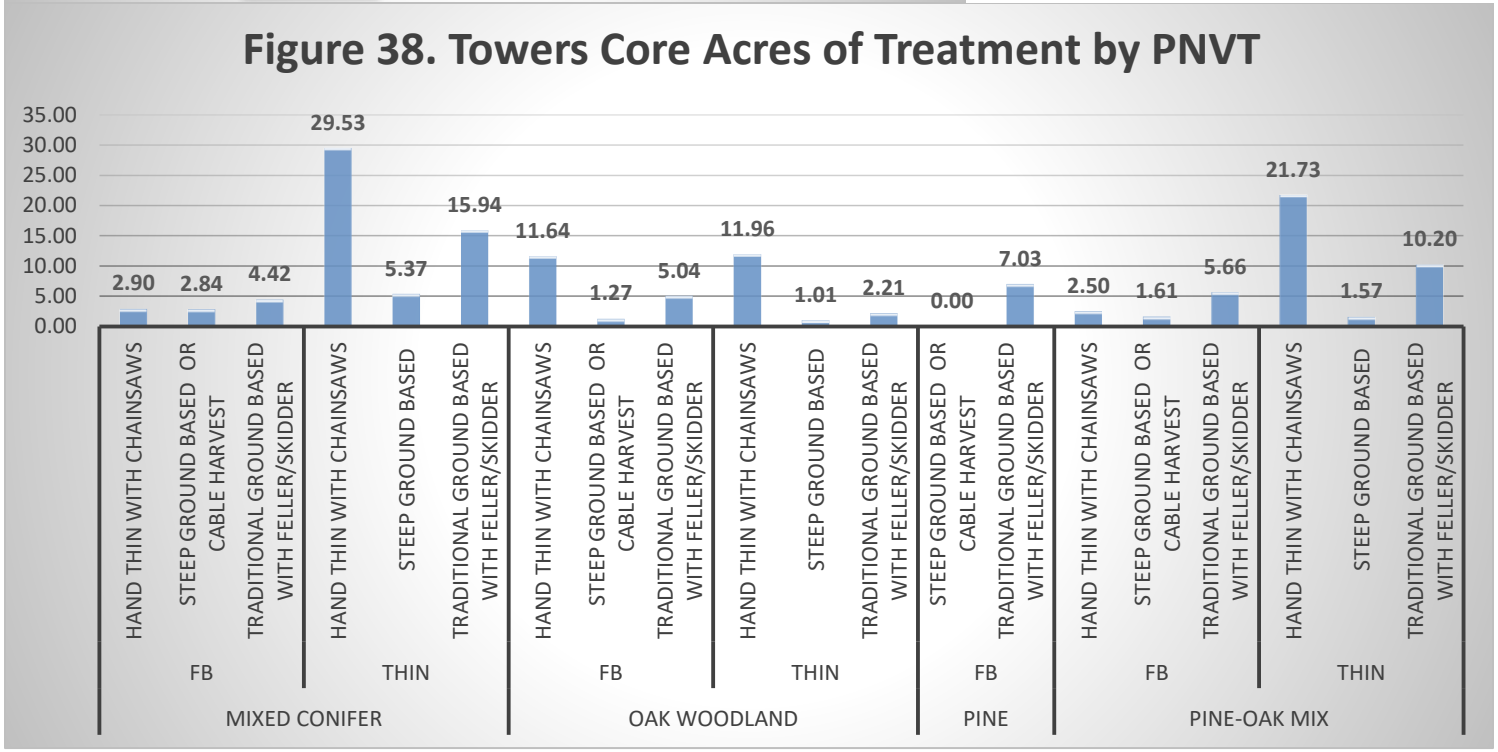
With the splintered land ownership pattern (Map 26), Towers has the most fuel breaks proposed in a PAC at 360 acres (Map 27). Towers recently had a pair of MSO with 2 young in 2017 (Table 10).
The fractured nature of the territory presents unique challenges to maintaining the integrity of the PAC. It is unknown if or how much adjacent private property might be used by the MSO documented within the Towers PAC. The Forest Service does not monitor MSO occupancy on private land or the activities or uses occurring on adjacent private property. With 40% canopy cover, the fuelbreaks will meet the canopy cover minimum for desired conditions for MSO nesting/roosting habitat. One pair of owls may be impacted by the treatments within the Towers PAC.

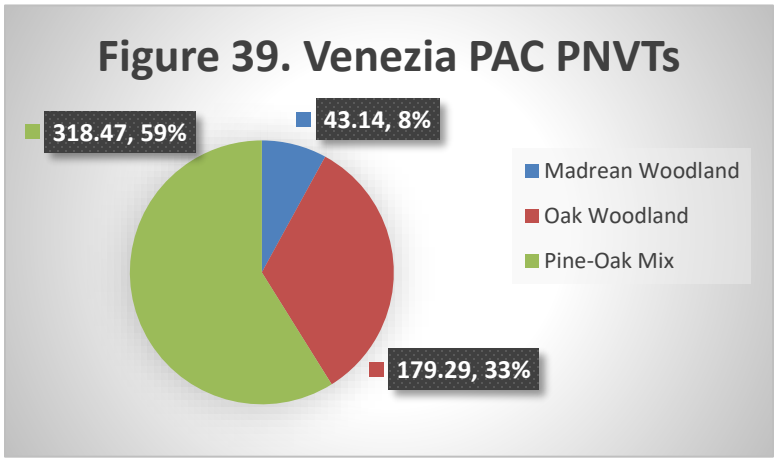






The entire Towers PAC lies within the perimeter of the 2012 Gladiator Fire with about 10% of the PAC experiencing medium burn severity. Yet, ironically, the PAC was occupied with a pair and two nestlings in 2017 (Table 10). The Towers PAC currently contains all of the desired conditions for the key habitat variables for nesting/roosting habitat and exceeds the thresholds for canopy cover. Where available, all of the key habitat variables would continue to be present in the PAC post-treatment including the minimum canopy cover even in shaded fuel breaks.





Venezia was last occupied in 1997 and has often been confused with adjacent PACs including Silver Spruce. It is unlikely that an MSO would be impacted by the vegetation changes from treatments (Map 15) within this PAC.

This PAC was also influenced by beetle kill and the August Fire which is why it currently lacks a good pine overstory (Map 14) and is just under the minimum canopy cover for desired conditions. The remainder of the PAC has great shrub species diversity and provides the many of the structural diversity components of the desired conditions for key variables for nesting/roosting habitat.

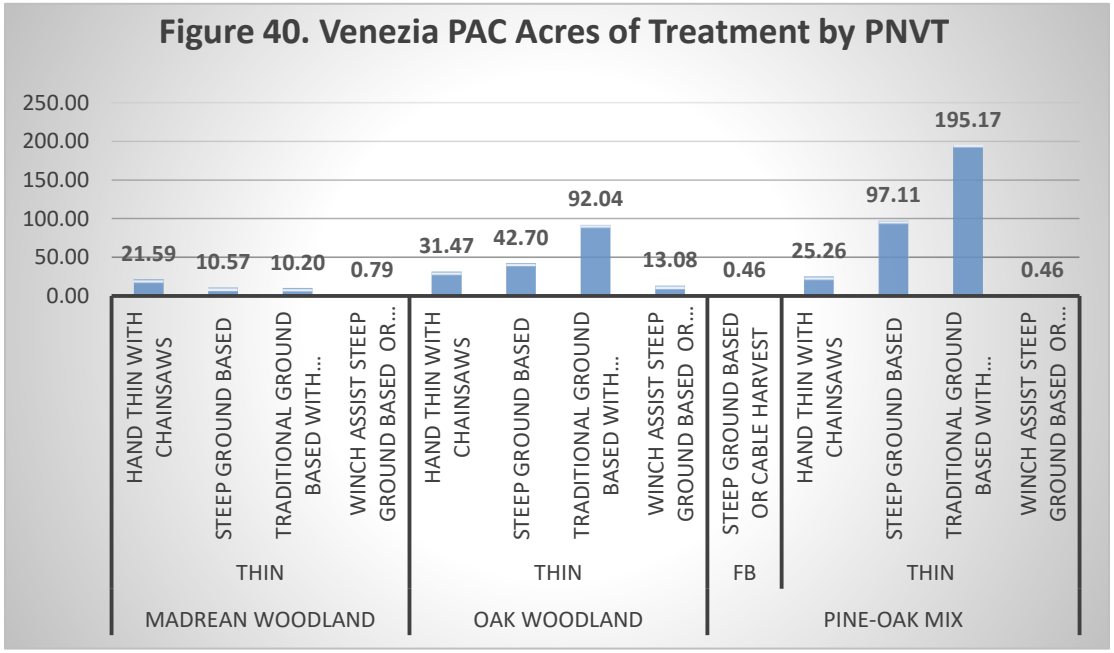


Figure 41. Venezia Core PNVTs

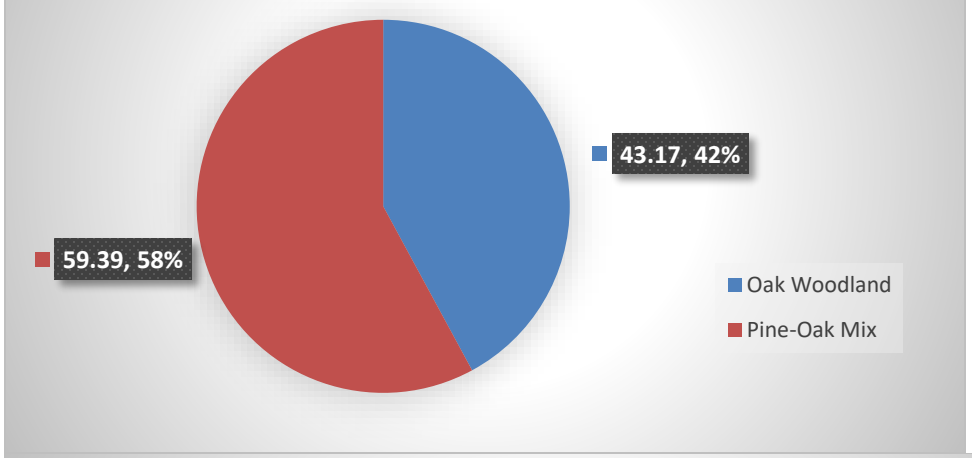
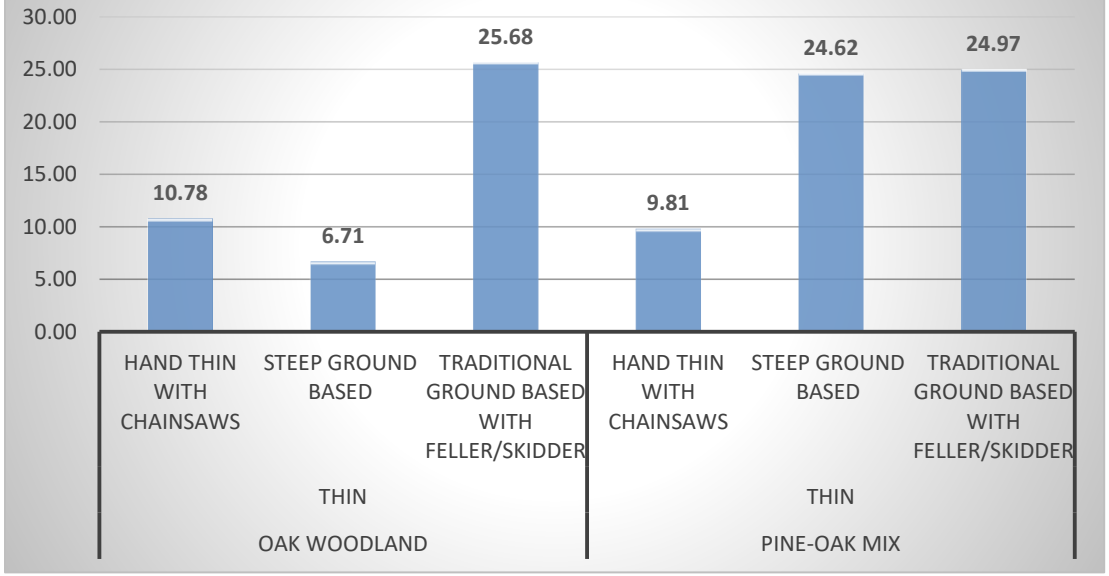
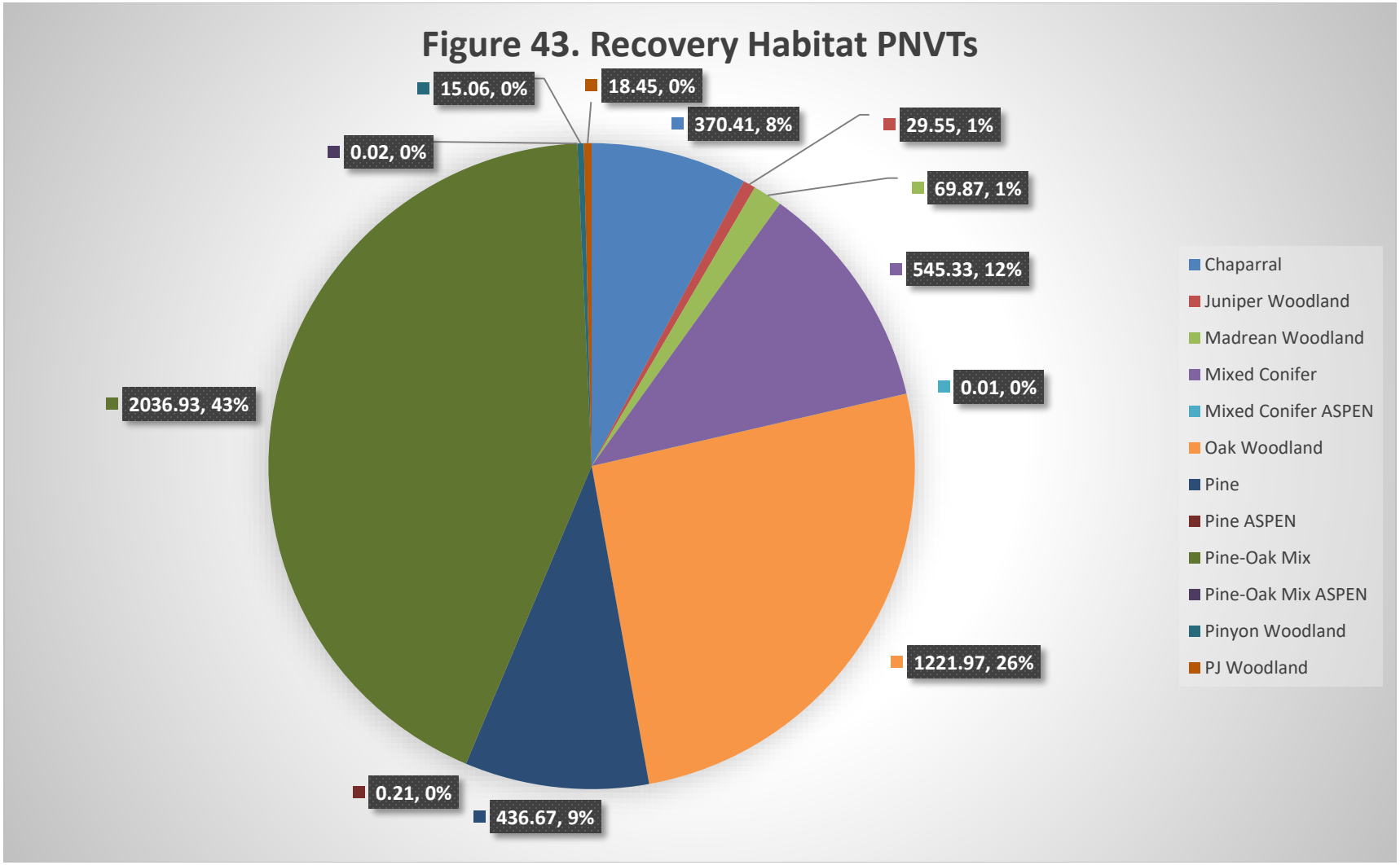


Figure 42. Venezia Core Acres of Treatment by PNVT





Recovery habitat was originally identified using the terrestrial ecosystem survey in the late 1990's. Due to the dynamic nature of the landscape and more detailed vegetation information, the changes in vegetation classification within those areas is reflected in the updated vegetation types within this graph.

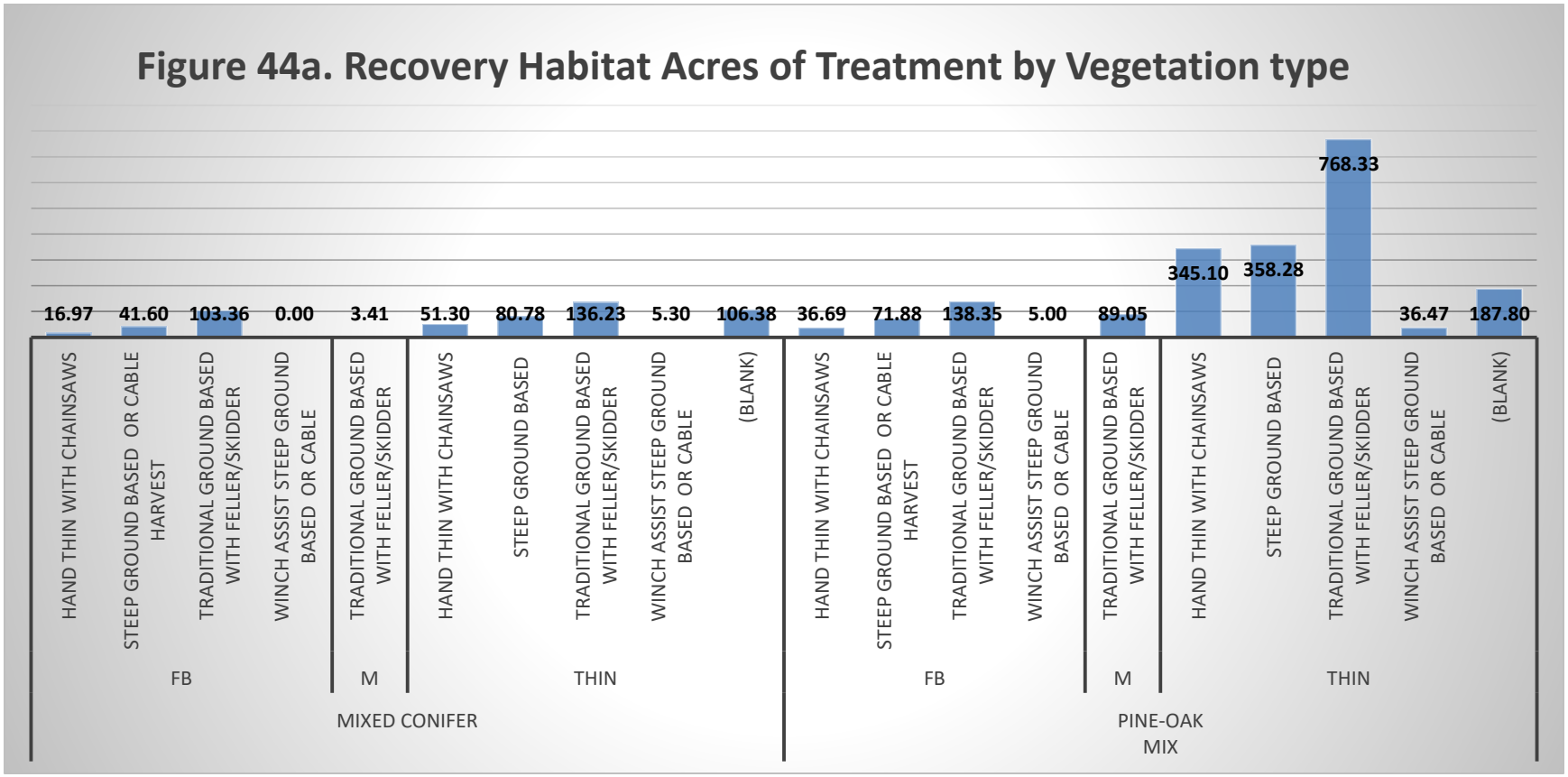


Figure 44a. Recovery Habitat Acres of Treatment by Vegetation type
16.97
41.60
103.36
0.00
3.41
51.30
80.78
136.23
5.30
106.38
36.69
71.88
138.35
5.00
89.05
345.10
358.28
768.33
36.47
187.80
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
WINCH ASSIST STEEP GROUND BASED OR CABLE
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
WINCH ASSIST STEEP GROUND BASED OR CABLE
(BLANK)
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
WINCH ASSIST STEEP GROUND BASED OR CABLE
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH FELLER/SKIDDER
WINCH ASSIST STEEP GROUND BASED OR CABLE
(BLANK)
FB
M
THIN
FB
M
THIN
MIXED CONIFER
PINE-OAK MIX

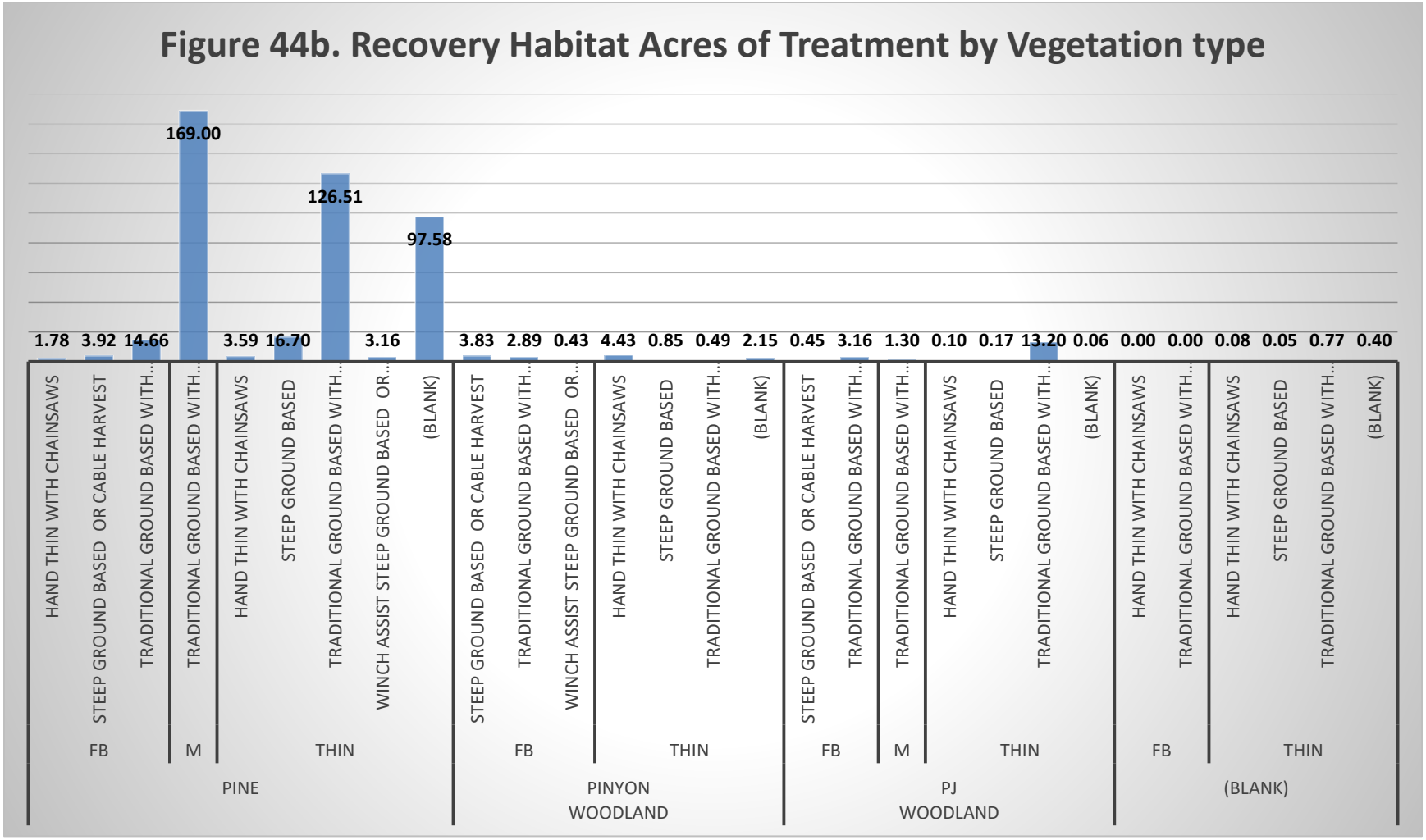


Figure 44b. Recovery Habitat Acres of Treatment by Vegetation type
169.00
126.51
97.58
1.78
3.92
14.66
3.59
16.70
3.16
3.83
2.89
0.43
4.43
0.85
0.49
2.15
0.45
3.16
1.30
0.10
0.17
13.20
0.06
0.00
0.00
0.08
0.05
0.77
0.40
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH...
TRADITIONAL GROUND BASED WITH...
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR...
(BLANK)
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH...
WINCH ASSIST STEEP GROUND BASED OR...
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
(BLANK)
STEEP GROUND BASED OR CABLE HARVEST
TRADITIONAL GROUND BASED WITH...
TRADITIONAL GROUND BASED WITH...
HAND THIN WITH CHAINSAWS
STEEP GROUND BASED
TRADITIONAL GROUND BASED WITH...
(BLANK)
HAND THIN WITH CHAINSAWS
TRADITIONAL GROUND BASED WITH...
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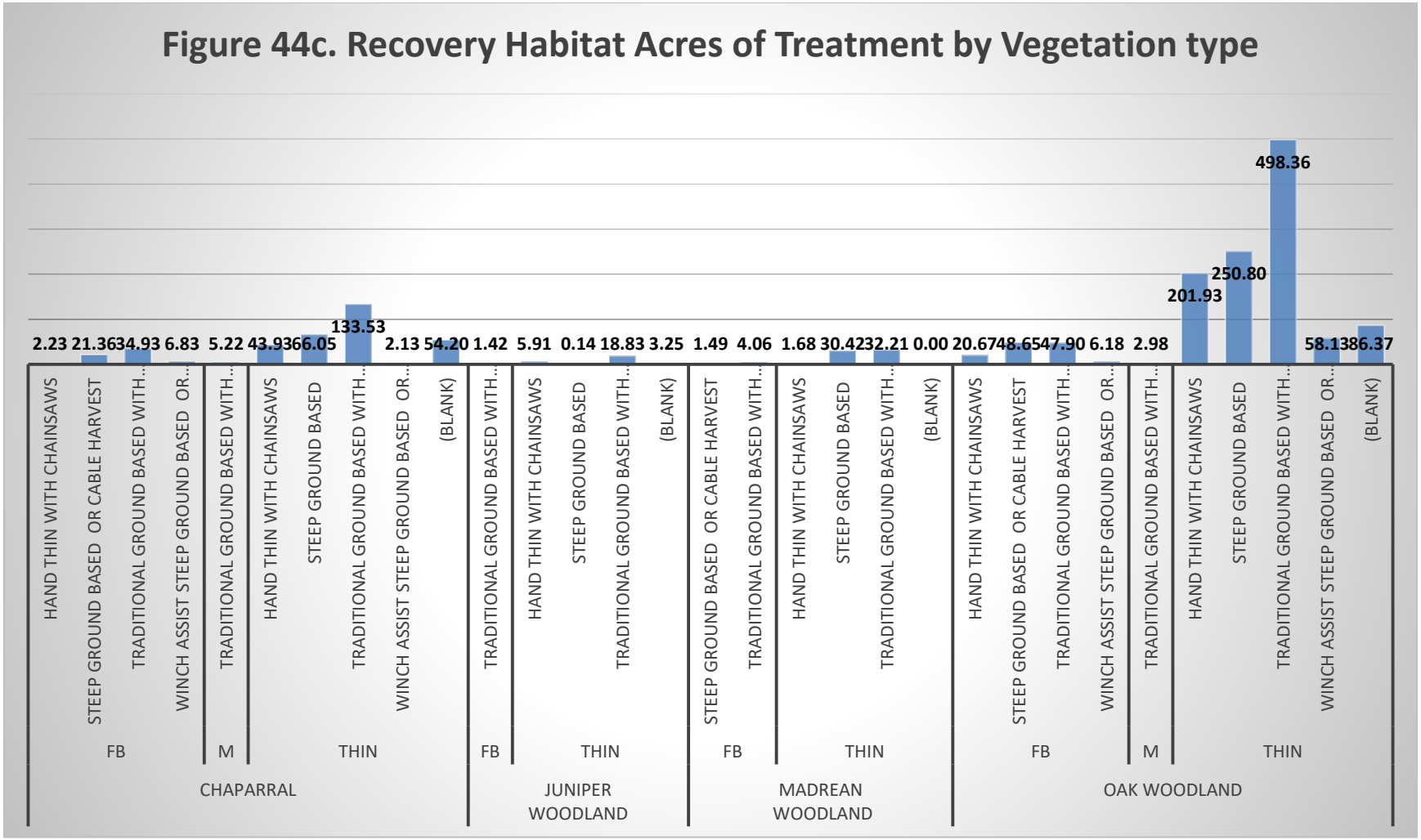


The table of data associated with the three preceding graphs can be found in Appendix C.

Recovery Habitat Effects

Table 17. Summary of treatments within Mexican spotted owl Recovery habitat						
	Total Acres Within Project Area	**Fuelbreak Hand Thin Acres (%)**	**Fuelbreak Mechanical Acres (%)**	**Mechanical Thin Acres (%)**	**Hand Thin Acres (%)**	**Prescribed Fire Acres (%)**
Recovery Habitat	4,745	78 (2%RH)	562 (12%RH)	2,638 (56%RH)	658 (14%RH)	4,745 (100)
Pine-Oak	2037	37 (1.8%P/O)	214 (10.5%P/O)	1163 (57%P/O)	345 (17%P/O)	2037 (100)
Dry mixed conifer	545	17 (3%MC)	145 (27%MC)	222 (41%MC)	51 (9%MC)	545 (100)
Other PNVTs	2163	24 (0.5%RH)	203 (4%RH)	1253 (26%RH)	262 (5%RH)	2163 (100)

Details of acres of treatments within the respective PNVTs within Recovery Habitat can be found in Table 23 in Appendix C. Attributes averaged across the six sampled recovery habitat stands would generally continue to meet or move toward the objectives and desired conditions for those attributes both directly after treatments and 20 to 40 years afterwards (Table 18). Data was averaged over the entire Recovery Habitat. Once again, the low basal areas projected for the future conditions are the result of high mortality associated with prescribed burning built into the program for the FVS model. After the initial thinning treatments, basal areas would not be expected to substantially decrease with subsequent prescribed burning. Fire prescriptions would be based on the changed conditions and designed to meet site specific objectives. . . Also, these values are for the entire recovery habitat. With 90% of the pine-oak and 75% of the dry mixed conifer being managed for lower basal areas, the projected stand values are lower than the threshold desired conditions for recovery nesting/roosting replacement habitat.

As recovery habitat is improved through thinning projects, stand structural diversity and the associated species composition diversity would be enhanced or increased.

- Live basal area - In communication with FWS, target basal area for ponderosa pine –oak outside of cores was 60-110 and 80-120 basal area in dry mixed conifer recovery habitat. The numbers in the Table 18 are the average for the entire Recovery Habitat acres and would be expected to be lower than the desired conditions for threshold conditions in Table C.3. of the MSO Recovery Plan. The Prescott NF has identified the best 267 acres of pine-oak habitat and 100 acres of habitat with dry mixed conifer components to be managed for nest/roost replacement habitat (Map 45). Within these replacement stands the treatments would reduce ladder fuels while maintaining a higher canopy cover of larger trees than the surrounding recovery habitat; putting it on a trajectory towards being suitable core habitat.
- Percent BA 12-18” dbh – This component exceeds minimums until the final year, according to the model. However, as explained earlier, the tree mortality for prescribed fire built into the FVS model exceeds the actual mortality experienced by the Prescott NF fire personnel. Also, as trees grow larger, they will move into the 18”+ range and out of this size class.
- Percent BA 18”+dbh - By thinning smaller diameter trees, the percent basal area in trees greater than 18”dbh that is currently just barely below minimum desired conditions will be immediately moved to above desired conditions. It will increase as more trees grow into this size class under the improved conditions from thinning.

- 18"+dbh TPA – The existing condition exceeds desired minimums and would be moved to desired conditions immediately post-treatment. The number of TPA greater than 18" would be expected to increase as more trees grow into that diameter class with the improved stand conditions after thinning. Again, mortality rates in the model are higher than those implemented on the ground.

As recovery habitat is improved, MSO in adjacent PACs may move into the recovery habitat, first on foraging forays and later perhaps to nest/roost as their territories are changed through time with project implementation. The forested landscape is and should be managed as a dynamic system with components changing, appearing and disappearing on the landscape and through time.

Table 18. Summary of Treatments proposed in Nest/Roost Replacement Recovery Habitat

		Hassayampa EA: Nest Roost Recovery		
		Dry Mixed Conifer	Pine Gambel Oak	Total
Thinning	Hand thin (Chainsaws)	29.78 acres	88.65 acres	118.43 acres
	Traditional Ground Based (Feller/Skidder)	42.29 acres	118.30 acres	160.59 acres
	Steep Ground Based (Ponsse)	13.87 acres	32.68 acres	46.55 acres
	Total Thinning	85.94 acres	239.63 acres	325.57 acres
Fuelbreak	Hand thin (Chainsaws)	1.92 acres	3.34 acres	5.26 acres
	Traditional Ground Based (Feller/Skidder)	6.95 acres	9.76 acres	16.71 acres
	Steep Ground Based (Ponsse)	.81 acres	9.07 acres	9.88 acres
	Total Fuelbreak	9.68 acres	22.17 acres	31.85 acres
Mastication	Total mastication	0 acres	0 acres	0 acres
	TOTAL PROPOSED TREATMENT	**95.62 acres**	**261.80 acres**	**357.42 acres**
	No Treatment	4.78 acres	5.92 acres	10.70 acres
	Total Acreage	100.40 acres	267.72 acres	368.12 acres

Table 19. Projected changes in forest structure for Mexican spotted owl recovery habitat between 2019 (post-mechanical treatment), 2021 (post-prescribed fire), 2037 and 2057, relative to the existing condition (2017), under the proposed action – Desired conditions are thresholds for 10% of the pine-oak and 25% of the mixed conifer Recovery habitat per Table C.3. of the MSO Recovery Plan.	
Forest Structural Attribute	**Recovery Habitat Stands Average** Objective: Reduce surplus to desired conditions
Live Basal Area (ft^2/ac) –Desired Condition 110 PIPO / 120 Mixed conifer	
2017 (existing condition)	254
2019	106
2021	61
2037	66
2057	72
Percent Basal Area 12-18” – Desired Condition >30	
2017 (existing condition)	35
2019	32
2021	34
2037	36
2057	25
Percent Basal Area 18” + - Desired Condition >30	
2017 (existing condition)	29
2019	36
2021	44
2037	44
2057	62
18” + dbh Trees per Acre – Desired Condition 12	
2017 (existing condition)	29
2019	12
2021	9
2037	9
2057	15

Cumulative Effects

The most notable non-federal projects occurring within or adjacent to MSO habitat within the project area is the proliferation of homes being built on private inholdings throughout the project area. The actual existing habitat conditions and MSO use of these adjacent private parcels is unknown. MSO occupancy monitoring has only been done on NFS lands.

Private land development is both modifying and eliminating likely existing MSO habitat. Reports of MSO on adjacent private lands have been known. These projects occurring adjacent to NFS lands may also be influencing MSO use of NFS lands. Disturbance of MSO from activities on private land could add cumulatively to disturbance from activities on NFS lands. Disturbances include loud voices, wandering pets, and possibly smoke from fire places or outdoor fire pits. Also, changes to the habitat on private land could be expected to be different from those on NFS lands and would not be cumulative effects.

Mexican Spotted Owl Critical Habitat

This analysis will focus on the Mexican Spotted Owl Critical Habitat Primary Constituent Elements related to forest structure and maintenance of adequate prey species habitat. There is no canyon habitat for MSO in the Hassayampa project area. The final rule for MSO Critical Habitat does not identify different criteria for PCEs among different vegetation types.

A. Primary constituent elements related to forest structure:

   1. A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45 percent of which are large trees with a trunk diameter of 12 inches (0.3 meters) or more when measured at 4.5 feet (1.4 meters) from the ground;

   2. A shade canopy created by the tree branches covering 40 percent or more of the ground; and

   3. Large dead trees (snags) with a trunk diameter of at least 12 inches (0.3 meters) when measured 4.5 feet (1.4 meters) from the ground.

B. Primary constituent elements related to maintenance of adequate prey species:

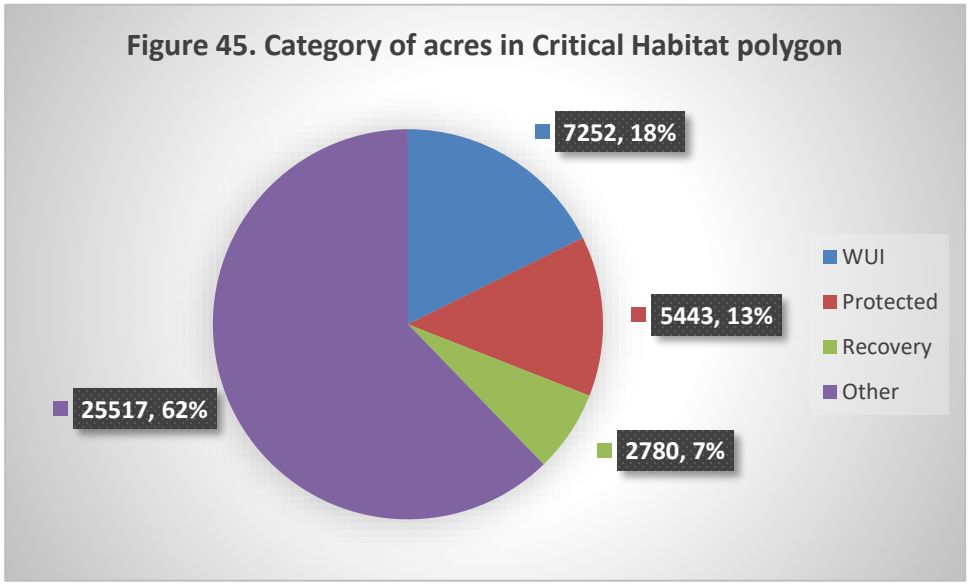
   1. High volumes of fallen trees and other woody debris;

   2. A wide range of tree and plant species, including hardwoods; and

   3. Adequate levels of residual plant cover to maintain fruits, seeds, and allow plant regeneration.

Affected Environment

A total of 40,992 acres are in the Mexican spotted owl critical habitat polygon within the project area (Map 3). Of that, 7,252 acres (18%) are within mapped wildland-urban interface that is excluded from designation as critical habitat. Of the remaining 33,740 acres within the critical habitat polygon, 2,780 acres are recovery habitat (7%) and 5,443 acres are protected habitat (13%) for a total of 8,221 acres (20%) that will be analyzed in this section (Maps 41 and 43).

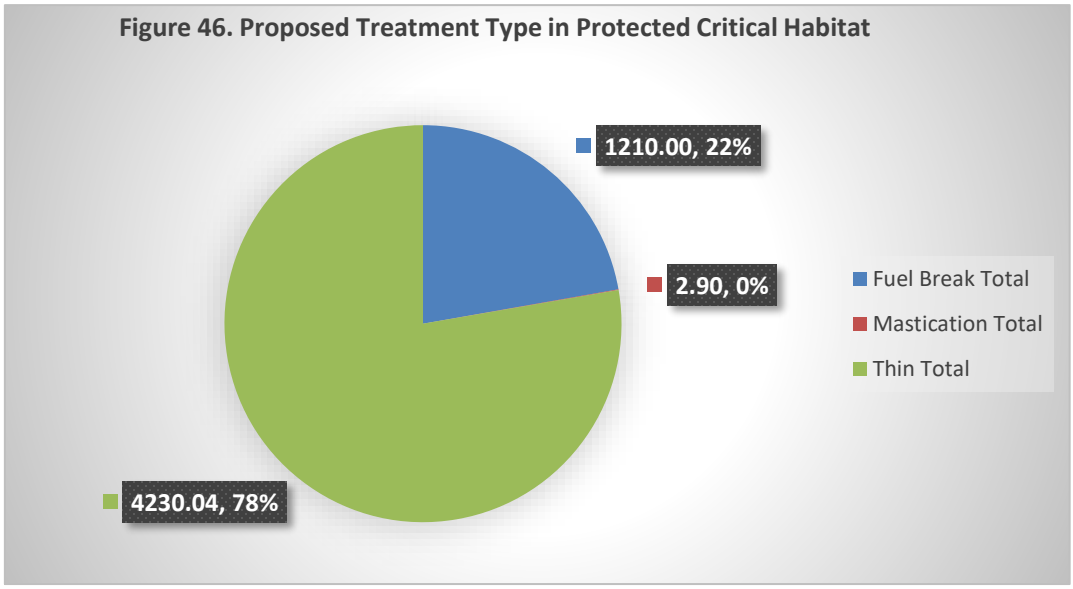


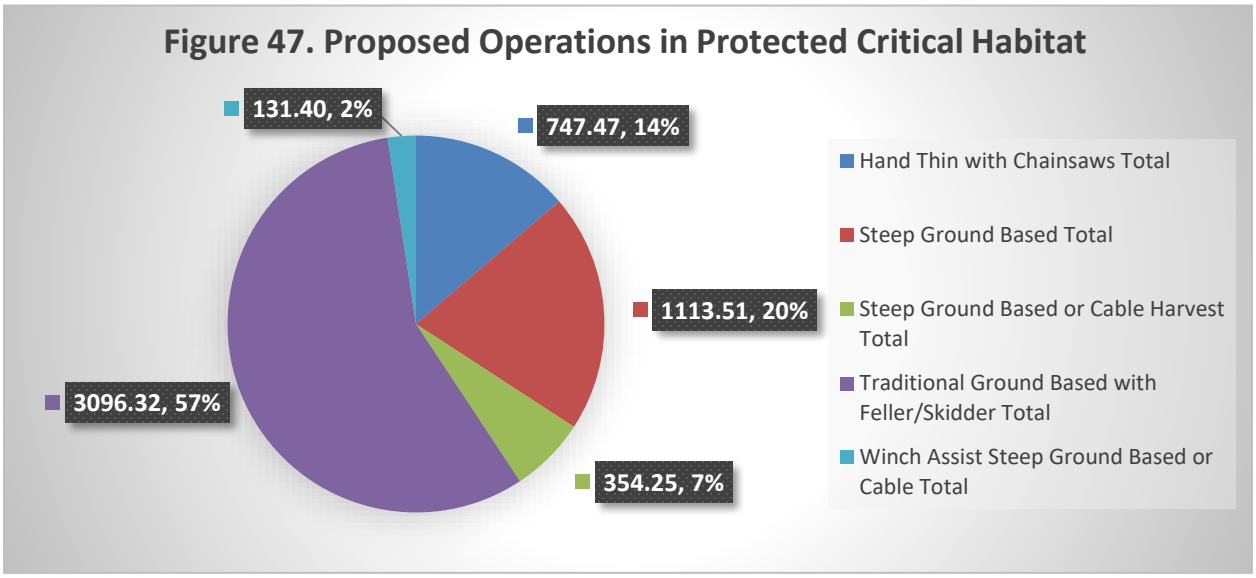
Environmental Consequences

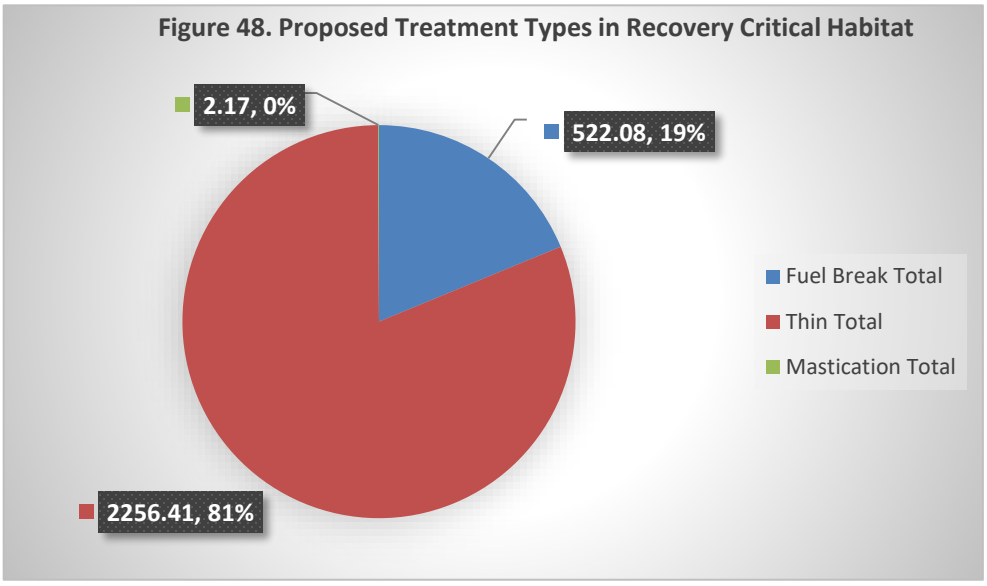
Selected Alternative

Direct and Indirect Effects to Primary Constituent Elements

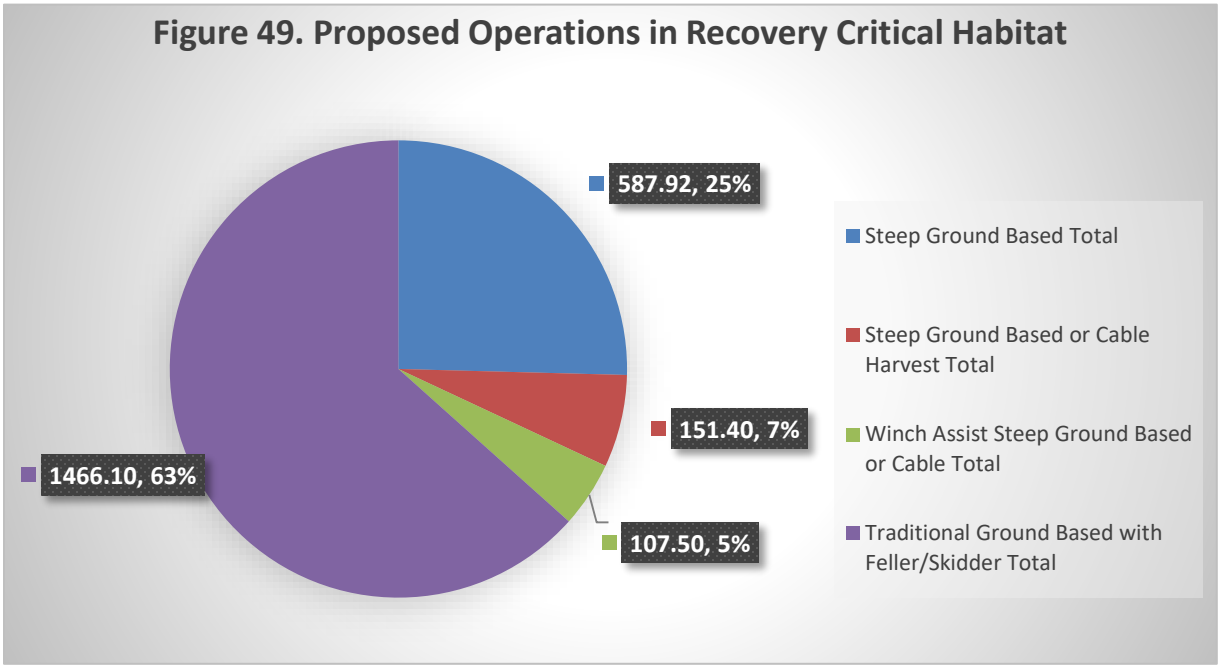
The following graphs show the types of vegetation treatments proposed in protected and recovery habitat. All acres (100%) are proposed for prescribed fire. There are also graphs showing the relative percent of each type of operation in each habitat category. See Map 42 for proposed treatments in Protected Critical Habitat.







See Map 44 for proposed treatments in Recovery Critical Habitat.



The effects to the vegetation and structure of the stands has already been discussed for each of the treatment types and the different operations. Now these effects will be related to the primary constituent elements associated with forested habitat.

1) **PCEs related to Forest Structure:**

- **Range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30-45 % of which are large trees with 12 inches dbh or greater**:

    - Trees greater than 12 inches dbh will be removed within CH. In general, where thinning would be conducted, in the spatially predominant forest matrix (outside new openings), the balance of tree size-classes and forest stand structures would immediately change toward larger-diameter (>16"dbh), upper-level trees, because proposed treatments focus on removing smaller, lower-level trees. The inherent spatial arrangement of the trees, whether random or in groups, would be retained in the prescription designs in concert with the dominant tree species on the site. Thinning of stands will create conditions conducive for growing trees into and beyond the 12"diameter class in the long term effects of most of the treatments. In shaded fuel breaks, 12" trees will be removed in favor of the larger, taller overstory trees. For the PACs where 12-18" trees are lacking, there is an abundance of 18"+ dbh trees.

    - The landscape is currently lacking in both young trees and large older trees. Thinning treatments will reduce stand densities to allow remaining overstory trees to grow into larger diameter classes than can grow in the currently dense over-stocked stands. Also, creating openings will provide places for tree regeneration across the landscape.

    - The range of tree species is not expected to change due to these treatments. All species currently occurring in the project area will continue to occur post-treatment, maybe in different proportions or extent of presence than current conditions. As restoration treatments move the landscape towards the desired conditions, the extent of shade-tolerant species that have unnaturally increased outside the natural range of variability

due to the lack of natural fire disturbance regime may be decreased after treatments. Residual stands will be healthier and more resilient to possible future fire on the landscape as well as insects and diseases. Other species that have decreased due to closed canopies and lack of space and nutrients, may increase as canopies are opened and more water and sunlight are available for other tree species including oak, aspen, and riparian trees.

- **Shade canopy cover covering 40% or more of the ground**:

    - While the existing canopy cover for most of the landscape exceeds 40%, treatments will inherently reduce canopy cover as basal area is reduced. The target basal areas for protected and nest/roost replacement habitat would retain greater than 40% canopy cover post-treatment where available. The target basal area for the remainder of recovery habitat would provide for a range of canopy cover with some areas being less than 40% and others above. These results will actually be a result of the existing density of the stands. If a stand does not have 40% canopy cover prior to treatment, it cannot have it after treatment. However, thinning will help residual trees retain more of their crowns to provide better canopy cover as they continue to grow in the improved stand conditions.

- **Large dead trees (snags) ≥12" dbh**:

    - With recent beetle activity, existing snag and associated down woody debris levels exceed those recommended in the LRMP for all forested vegetation types within the project area. All prescriptions and treatments would be designed to comply with the LRMP direction for the respective PNVTs and retain the desired snag component for the site specific activity. Consistent with Forest Plan biological opinion Mexican spotted owl terms and conditions, the Prescott National Forest will work with the USFWS during Hassayampa Project-specific consultations to define "adequate" based upon site-specific conditions. The Forest Plan suggests 1 to 2 snags per acre greater than 18 inches dbh for both the Ponderosa Pine-Gambel Oak and Ponderosa Pine-Evergreen Oak PNVTs. It also suggests an average of three logs per acre in addition to 3 to 10 tons per acre of coarse woody debris for both PNVTs (DC-Veg13 and 17). Because the dry mixed conifer is part of the Pine-Gambel Oak PNVT with frequent fire, these criteria would apply to these stands as well. Desired levels of snags will be incorporated into prescribed fire design criteria.

    - Snags that present safety hazards will be removed during all operations. Soft snags will be targeted for removal within fuelbreaks in order to design effective fuel breaks. Sound snags will be retained within fuelbreaks and also continue to be available in the remainder of the landscape away from private property boundaries.

2) PCEs related to maintenance of adequate prey species:

- **High volume of fallen trees and other woody debris:**

    - Most thinning treatments will generate some level of down woody debris, to varying levels. Where it is possible to remove slash from the site that will be preferred to prevent extreme excess fuel accumulations. Where appropriate, residual slash will be disposed of via broadcast and/or pile burning. The mosaic nature of burning will provide for retaining down woody debris across the landscape.

- Fallen trees occur across the landscape. Thinning treatment may create additional fallen trees across the landscape. Prescribed fire may eliminate some of the fallen trees across the landscape but will not be designed to consume all of the fallen trees.

- While this PCE is important to the MSO and its prey species, it is also in direct conflict with managing the landscape within a wildland urban interface where life and property are at risk from fire. Balancing the interests of these two conflicting resources will be discussed during consultation with USFWS.

- **Wide range of tree and plant species including hardwoods**:

    - Thinning treatments would remove individual trees from the landscape but not the species themselves. The effects of the thinning treatments would increase the diversity of the plant species composition in Mexican spotted owl critical habitat as canopies are opened and understory grass and shrub species respond to additional light, water, and nutrients being available. Hardwood trees would also respond favorably to the treatments as more diverse conditions are created allowing for more light and nutrients to hardwoods trees. During burns, plants would be consumed by fire. However, shortly afterward and in the long term, prescribed fire would enhance the vegetation structure and conditions that provide a diversity of tree, grass, and shrub species across the landscape.

- **Adequate levels of residual plant cover to maintain fruit, seeds, and allow plant regeneration**:

    - Initial thinning operations may temporarily reduce the residual plant cover within a stand where machinery or skidding impact the vegetation. The expected increase in herbaceous vegetation as the result of most of the thinning treatments has already been discussed at length. Prescribed fire may initially decrease this primary constituent element immediately post-treatment, however, there would be an expected increase in this within the first growing season as fire-adapted plants respond to the effects of fire through sprouting and regrowth. The re-sprouted plants will provide more palatable nutrition for species and produce more abundant seed heads for food for small mammals, birds and reptiles, all prey species of the MSO.

Cumulative Effects to Primary Constituent Elements

Critical habitat does not occur on lands other than federal lands. Activities on adjacent private lands would not be impacting any of the physical components of the PCEs for MSO critical habitat within the project area.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The proposed action of the Hassayampa Landscape Restoration Project would comply with the Prescott National Forest Plan standards for terrestrial wildlife resources, which would protect and/or benefit terrestrial resources.

Compliance with the Endangered Species Act would be completed for federally listed species in the project area. This project would not make irreversible or irretrievable commitments and the status quo would be maintained during the consultation process.

Other Agencies and Individuals Consulted

The scoping letter for the Hassayampa Project was sent to the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department for their comments to the proposed action related to wildlife species in the project area. No comments were received from the Arizona Game and Fish Department relevant to the MSO. The USFWS sent a letter expressing concern about the extent of the aspen treatments within MSO core habitat and asking to coordinate with the Prescott NF on designing the project to retain nest/roost habitat.

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Endangered Species Act Aquatic Species and Habitats

Species Identification

Federally listed aquatic species or their habitats known in the Hassayampa Project area or potentially affected by actions in the project area are listed in Table 20.

Table 20. Aquatic species identified for the Hassayampa Project

Common Name	Scientific Name	Federal Status	Critical Habitat
Gila trout	*Oncorhynchus gilae*	Threatened[1]	None

[1] Listed threatened under the Endangered Species Act: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Gila Trout

Status Range-wide/Life History

The Gila trout was originally recognized as endangered under the Federal Endangered Species Preservation Act of 1966 and then under the Endangered Species Act of 1973. The Gila trout was down-listed from endangered to threatened in 2006 (U.S. Fish and Wildlife Service 2006). No critical habitat has been designated for Gila trout. The Gila trout is endemic to the Gila River Basin of New Mexico and Arizona and is found in moderate- to high-gradient-perennial mountain streams above 5,400 feet to over 9,200 feet elevation. Currently, there are 16 populations of Gila trout in the wild (U.S. Fish and Wildlife Service 2003; Arizona Game and Fish Department 2009). Primary threats to Gila trout include hybridization, competition, and/or predation by non-native trout species, habitat degradation, and wildfire.

The following information on Gila trout habitat requirements is taken from the revised Recovery Plan (U.S. Fish and Wildlife Service 2003). Gila trout is found in moderate- to high-gradient-perennial mountain streams above 1,660 meters (5,400 feet) elevation. Streams typically flow through narrow, steep-sided canyons and valleys. The species requires water temperatures below 25 ºC (77 ºF), clean gravel substrates for spawning, continuous stream flow of sufficient quantity to maintain adequate water depth and temperature, and pool habitat that provides refuge during low flow conditions and periods of thermal extremes. Abundant invertebrate prey, cover, and water free from contaminants are also required. Cover typically consists of undercut banks, large woody debris, deep pools, exposed root masses of trees at water's edge, and overhanging vegetation. Populations of Gila trout are particularly sensitive to impacts that cause reductions in cover and pool depth.

Spawning of Gila trout occurs mainly in April. Spawning begins when temperatures reach about 8 ºC (46 ºF), but day length may also be an important cue. Female Gila trout typically construct redds in water 6 to 15 centimeters (2.4 to 6 inches) deep within 5 meters (16 feet) of cover. Fry (20 to 25 millimeters [0.8 to 1.0 inch] total length) emerge from redds in 56 to 70 days. Suitable spawning habitat substrate composition for development of eggs and embryos is characterized by approximately 7 percent or less fines (particles less than 1 millimeter [0.04 inch] diameter) by weight. Coarse sands and gravels ranging from 1 millimeter (0.04 inch) to 18 millimeters (0.7 inches) diameter compose approximately 60 percent of the substrate in suitable habitat for eggs and embryos.

Status in the Analysis Area

Information on existing conditions of aquatic resources within the Hassayampa Project area is confined to upper Grapevine Creek with occupied/suitable habitat for the threatened Gila trout. Gila trout were introduced into Grapevine Creek (Big Bug Creek 6th-field watershed) in 2009 (Arizona Game and Fish Department 2009). The 1-mile perennial reach of Grapevine Creek is entirely within the Prescott National

Forest and occurs within the Grapevine Botanical Area (USDA Forest Service 1997). Management direction for this area includes no livestock grazing, no motorized or mountain bike use of trails within the botanical area, and recreation use is restricted to day use only (see Special Area Designations page 11). Forest Trail #4 accesses Grapevine Botanical Area and parallels the creek for about 0.5 miles. Overall, recreation opportunities are limited and use is low. There are no mining activities within the Grapevine Botanical Area.

The perennial reach of Grapevine Creek begins at the Grapevine Springs complex and flows for about a mile within the Grapevine Botanical Area. Downstream of this perennial reach, the creek is intermittent for about 0.6 miles and then ephemeral for the next 2.7 miles to the confluence with Big Bug Creek. Water temperature monitoring was conducted in 2008 to 2009 with daily maximum stream temperatures not exceeding 20 ^{o}C (Anderson 2014). The main vegetation types within the upper Grapevine Creek drainage area with perennial water are Ponderosa Pine/Gambel Oak and Chaparral (Figure 52). The drainage is relatively narrow with an easterly flow, gradients of 3 to 7 percent, and mainly boulder-cobble and bedrock substrates. Slopes along the drainage are generally between 30 to 60 percent. The riparian vegetation associated with the perennial springs and stream is an Arizona alder and Arizona walnut community.

The Goodwin Fire in July of 2017 burned within Gila trout occupied habitat in Grapevine Creek. Of the 892-acre Grapevine Creek drainage area within the botanical area, 734 acres (82 percent) burned with some level of burn severity and 158 acres were unburned (Figure 50). Of the burned acres, about 330 acres (37 percent) burned with low severity; 350 acres (39 percent) with moderate burn severity; and 54 acres (6 percent) burned with high burn severity. The majority of the moderate and high burn severity occurred along the perennial reach of Grapevine Creek. There was high accelerated erosion and soil loss in areas that experienced moderate to high soil burn severity, due to water repellency, limited soil cover, and steep slopes. Field observations of Grapevine Creek in October 2017 noted fire impacts to riparian and aquatic resources. The majority of pool habitats had filled with sediment post flooding in the drainage. Electrofishing and visual surveys of Grapevine Creek did not report any Gila trout present in the system (Stephens 2017 pers. comm.). Field observations of Grapevine Creek in September 2018 to assess the stream noted that pool and substrate conditions were suitable for restocking of Gila trout (Stephens 2018 pers. comm.). Restocking is scheduled for 2019.

Surface erosion and runoff in the upper Grapevine Creek watershed is influenced by many factors such as soils types, vegetative cover, and slopes. Natural erosion in the watershed occurs with precipitation events and results in sediment input to the stream, which is incorporated and eventually processed through the system (sediment transport). Excessive sediment can be generated from proposed forest management activities based on the inherent potential for erosion in the project area, which could overwhelm the streams capacity to assimilate and transport the sediment through the system. A measure of soil loss is the

erosion hazard rating. Information on the erosion hazard for the project area described below is summarized from the Soils Resource specialist report.

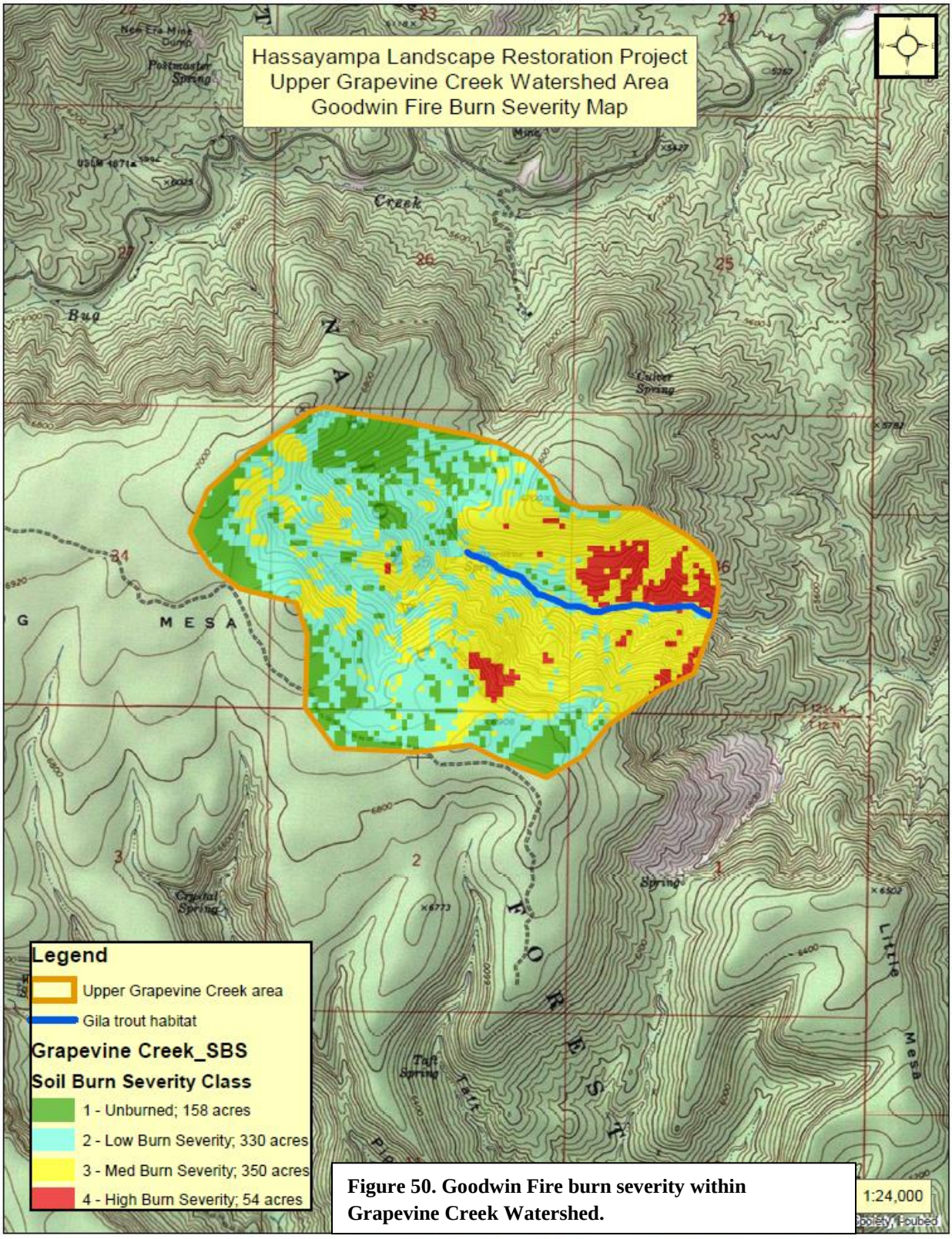

Figure 50. Goodwin Fire burn severity within Grapevine Creek Watershed.

The inherent potential for erosion exist in the project area, given some form of past disturbance and also from natural erosion levels of soils, especially on slopes greater than 40 percent. The erosion hazard ratings and acres by potential natural vegetation type are shown in Figure 51. Erosion hazard ratings can vary from low to severe, with low ratings meaning low probability of adverse effects on soil and water quality if accelerated surface erosion occurs. Moderate erosion hazard rating mean that accelerated erosion is likely to occur in most years and water quality impacts may occur. Severe erosion hazard rating means that effects to soil productivity and water quality are likely to occur when accelerated erosion happens. Although much of the project area has severe erosion hazard rating, the actual erosion hazard is lower under current conditions, mostly due to the fact that there is not a lot of bare soil exposed. Most of the soil has some cover (rock, woody debris, vegetation, or litter). Erosion hazard is likely still moderate to severe where slopes are steeper than 40 percent and bare soil exists. Fire in the project area can increase soil erosion potential where soils become water repellent (hydrophobic) and/or there is high consumption of protective ground cover which can increase erosion and runoff to streams.

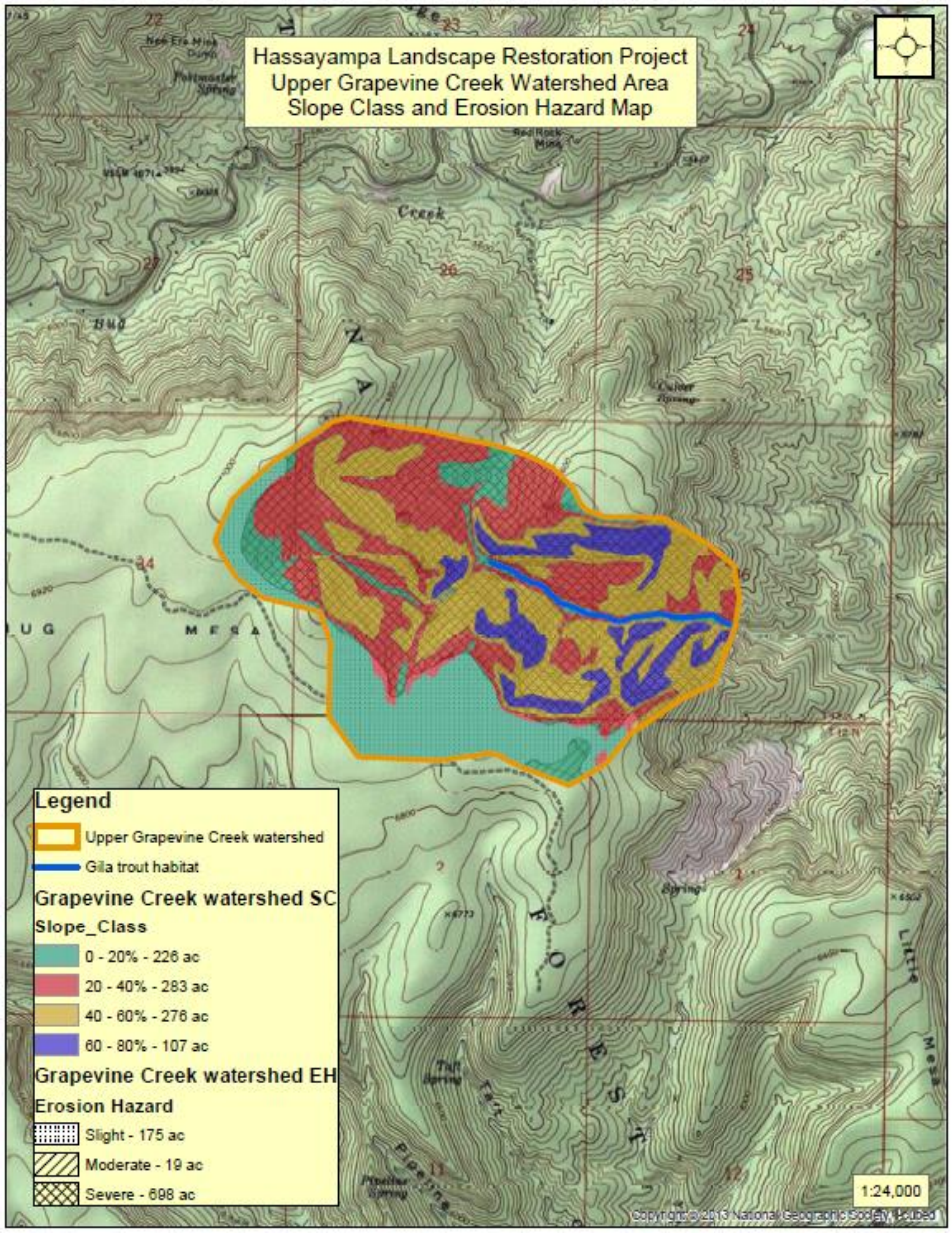

Figure 51. Slope Class and Erosion Hazard Ratings.

Water temperature data-loggers have been installed in Grapevine Creek in the project area. Water temperature monitoring in Grapevine Creek conducted from July 2008 to April 2009, March 2016 to July 2017, and October 2017 to May 2018 reported daily maximum stream temperatures not exceeding 20 °C (Anderson 2014, Tracy Stephens pers. comm.). Information on water temperature changes in this stream post-Goodwin Fire will continue to be collected.

Environmental Consequences

The vegetation treatments proposed within the upper Grapevine Creek watershed include prescribed fire and hand thinning. Most of the upper Grapevine Creek watershed area is open to prescribed fire. As this area falls within the Goodwin Fire perimeter it would receive maintenance burns in the future based on ecological conditions related to fire regimes and PNVTs. In addition, a total of 535 acres are proposed for hand thinning with chainsaws (Figure 52). Given the impacts from the recent Goodwin Fire, no mechanical treatments would be implemented within the Grapevine Botanical area. In addition, there would be no effects from fuel break construction or transportation actions because these actions would not occur in the Grapevine Botanical area.

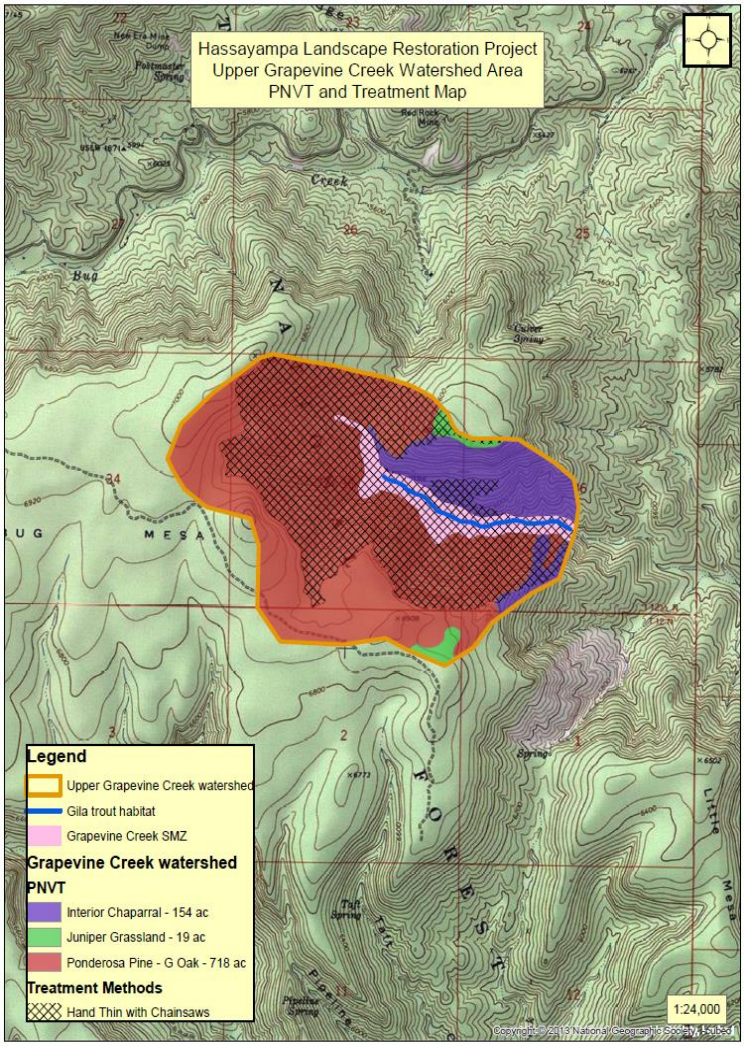

Figure 52. Upper Grapevine Creek Watershed PNVT and Treatment map.

This project also includes resource protection measures, which are intended to assure that projects comply with standards and guidelines of the Prescott Land Management Plan, as well as other Federal and state

laws, regulations, and policy. Resource protection measures are a required component of the proposed action and are intended to reduce, minimize, or eliminate impacts to various natural and human resources. The full list of resource protection measures are provided in the environmental assessment. Specific resource protection measures relevant to this analysis are addressed in this section and listed in Appendix A of this document.

Direct and Indirect Effects

Prescribed Fire Effects

Prescribed fire treatments would occur within the upper Grapevine Creek watershed in the project area being analyzed for aquatic resources. The majority of this watershed (718 acres, 80%) is in the Ponderosa pine-Gambel oak vegetation type. The Desired Condition for the vegetation type is for frequent, low burn severity fires, occurring in a 1 to 15 year fire return interval. The Interior chaparral vegetation type makes up 17% (152 acres) of the watershed with a Desired Condition for infrequent, high burn severity fire, occurring every 35 to 100 years.

With implementation of resource protection measures (G-1, G-5, G-6, G-10 – Appendix A), direct effects to Gila trout are unlikely because no direct fire ignition would occur within the established stream management zone for Grapevine Creek, and any fire backing into the Grapevine Creek SMZ would be managed for a low burn intensity. This should reduce the potential for direct heating of water temperatures, provide an adequate buffer to filter the majority of mobilized erosion before entering project area stream, and maintain riparian vegetation along upper Grapevine Creek. These measures would help to protect Gila trout from prescribed fire over the life of the project.

There would be indirect effects from sedimentation to Gila trout and their habitat with prescribed fire treatments in the upper Grapevine Creek watershed. Potential indirect effects from prescribed fire would depend on how much of the upper Grapevine Creek watershed is treated and the level of soil burn severity. The physical character of the watershed such as vegetation and soil types, vegetation seral stages, slopes, and other factors would influence burn severity (Figure 50). Prescribed fire treatments would have short-term impacts to soil productivity and increased runoff and erosion in the treated area due to the decrease in vegetative cover. With implementation of resource protection measures (A-3, A-4), prescribed fire would typically result in a mosaic pattern of burned and unburned vegetation and predominately low-burn severity in most potential natural vegetation types which would reduce the above impacts. In the short term, the potential for soil erosion could increase post-fire, especially on areas where slopes are steep and the current soil erosion rates are already above tolerable levels. Erosional effects would be most extreme where the majority of vegetation and duff has been consumed by fire, soils are highly erosive, and large precipitation events occur soon after the fire (Gresswell 1999). With implementation of resource protection measures (H-1, H-5 – Appendix A), prescribed fire would be minimally utilized on slopes greater than 40 percent and extra measures would be taken to ensure soil cover remains intact.

Surface runoff and erosion are expected to occur with storm events (typically monsoons or winter) following treatments with sediment and nutrients being transported from the uplands and eventually inputted into Grapevine Creek. There would be short-term effects of sedimentation to water quality, macroinvertebrate communities, and deposition within pool and riffle habitats. The potential amount of sedimentation would be reduced through implementation of resource protection measures and with the natural hydrologic regime of Grapevine Creek to transport sediment through the system, habitat and water quality should be maintained within acceptable levels for the Gila trout in the long-term.

Overall, prescribed fire would improve soil and watershed conditions, restore the natural fire regime, and reduce the potential for wildfire. This would have long-term beneficial effects to the species and their habitat in the project area.

Hand Thinning Treatment Effects

A total of 77 acres have proposed hand treatments within the upper Grapevine Creek stream management zone. Tree thinning within this zone using hand methods would reduce tree densities and fuel loads to desired conditions. There would be no direct effects to Gila trout because tree thinning would not occur within the aquatic environment or result in any direct contact with any individual fish.

There may be indirect effects to Gila trout from tree thinning within the upper Grapevine Creek SMZ due to reduced tree densities and potential impacts from solar radiation to water temperatures. Implementation of resource protection measures for the stream management zones (G-1, G-2, G-3, G-4, G-5), such as no treatment of facultative or obligate riparian vegetation in the zone, should mitigate any changes to water temperatures within the small amount of stream management zone area being treated. This would maintain favorable water temperatures for Gila trout in the project area.

A total of 535 acres of hand treatments could occur in the upper Grapevine Creek watershed (Figure 52). Treatments would entail hand thinning using a chainsaw. Slash would be piled or scattered following treatment. With implementation of resource protection measures (A-3, H-1) tree thinning in the uplands of the upper Grapevine Creek watershed is unlikely to result in runoff and erosion from treated sites due to the increase in vegetative ground cover. Potential indirect effects of sedimentation in treated areas would be insignificant and discountable to Gila trout and their habitat in Grapevine Creek.

Summary

Table 21. Summary of effects for a federally listed aquatic species analyzed for the Hassayampa Project, Prescott National Forest

Species	Species Status	Alternative 2 Proposed Action
Gila trout	ESA Threatened	May Affect, Likely to Adversely Affect

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The proposed action of the Hassayampa Landscape Restoration Project would comply with the Prescott National Forest Plan standards for soil and hydrology resources, which would protect and/or benefit aquatic resources. The proposed vegetation and fuel treatments in each alternative are not expected to adversely affect soil or hydrology resources because of resource protection measures that would be implemented as part of the proposed action alternative.

Compliance with the Endangered Species Act would be completed for federally listed species in the project area. This project would not make irreversible or irretrievable commitments and the status quo would be maintained during the consultation process.

Other Agencies and Individuals Consulted

The scoping letter for the Hassayampa Project was sent to the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department for their comments to the proposed action related to wildlife species in the project area. Comments were received from both agencies to protect aquatic resources, particularity Gila trout in Grapevine Creek, from project activities.

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USDI Fish and Wildlife Service. 2003. Gila trout (*Oncorhynchus gilae*) recovery plan (third revision). Region 2, Albuquerque, NM.

USDI Fish and Wildlife Service. 2006. Endangered and Threatened Wildlife and Plants; Reclassification of the Gila trout (*Oncorhynchus gilae*) from Endangered to Threatened; Special Rule for Gila trout in New Mexico and Arizona. Federal Register/Vol. 71, No. 137/Tuesday. 18, 2006; pages 40657-40674.

Summary of Environmental Consequences

Table 22. Summary of environmental effects to terrestrial listed species and habitat			
Resource Element	**Resource Indicator**	**Measure**	**Selected Alternative**
Mexican Spotted Owl	Effects of treatments on protected activity center/core habitat	Retention and development of key habitat variables relative to desired conditions in Table C2 of the MSO Recovery Plan	Where key habitat variables occur within MSO PAC habitat, these features would be retained or enhanced. Where certain components such as patch diversity, horizontal and vertical heterogeneity, diverse species composition, and openings are lacking, the proposed treatments would develop these habitat variables. Where minimum canopies or trees >16" dbh are lacking, the treatments cannot immediately create or improve these. They can however develop conditions that will facilitate the development of these key habitat variables in the long term.
	Effects of treatments on recovery habitat	Comparison of projected conditions to minimum desired conditions for threshold nesting/roosting habitat in Table C3 of the MSO Recovery Plan	The stand exam data for the Recovery habitat was averaged over six stands that were not necessarily identified as being managed for recovery nesting/roosting habitat. The replacement stands have been identified prior to implementing any projects. The stand exam shows the potential within the recovery habitat to meet or exceed desired conditions for the 4 parameters. Despite modelling results that reflect an inaccurate mortality for trees from maintenance prescribed burning, actual minimum basal areas, % BA in 12-18" dbh & 18"+ dbh, and tpa > 18" dbh are all expected to exceed minimum desired conditions.
	Effects of actions on Mexican spotted owls	Predicted MSO responses to treatments	Treatments are expected to disturb and displace non-nesting MSO outside of the breeding season. Treatments during the breeding season in PACs that are not occupied or in non-nesting status could disturb non-nesting owls. Changes to the physical structure of the territory could influence the MSO use of the habitat and possibly cause them to leave their territory. If enough components are available to meet the MSO needs, the strong site fidelity could influence MSO to staying in their territory. Also, if adequate components are present for new dispersing owls, vacated territories could become occupied by new owls. Smoke from prescribed burning could negatively impact nesting owls.
Mexican spotted owl Critical Habitat	Effects of treatments on critical habitat primary constituent elements	Are PCEs being maintained at adequate levels?	While the proposed treatments do remove existing PCEs within CH, there is currently an excess of most PCEs across the landscape. While 12"+ dbh trees are removed, there will be adequate levels of large trees within critical habitat. The range of tree species will not change due to the treatments. Age classes will be more balanced after the treatments. The relative abundance of species may shift as treatments restore natural conditions across the landscape. The existing canopy cover exceeds 40% in most places and would be retained at or above 40% post-treatment, where available. Soft dead trees (snags) >12"dbh would be removed where they occur within the shaded fuel breaks in order to create effective fuel breaks adjacent to private land. Snags that present safety hazards will also be removed. Snags greater than 12"dbh will continue to occur across the landscape in abundance. High volume of fallen trees and other woody debris would be in flux from the existing conditions with excess, to additional materials produced by treatments, to components being consumed in prescribed fire. This PCE is in direct conflict with managing NFS lands within the WUI.

Table 22. Summary of environmental effects to terrestrial listed species and habitat			
Resource Element	**Resource Indicator**	**Measure**	**Selected Alternative**
			Wide range of tree and plant species including hardwoods would continue to occur across the landscape. Individual plants would be removed during treatments, however the species would remain and possibly shift in distribution with the changing conditions on a dynamic landscape. Adequate levels of residual plant cover to maintain fruit, seeds and to allow regeneration would definitely be provided as many acres are restored, openings are created, and stand heterogeneity is created.

ESA Species and Habitats – Biological Assessment Determination of Effects:

The purpose of this biological assessment is to document the determination of effects of the proposed action on animals and habitats federally listed under the Endangered Species Act (ESA).

Based on the effects analyses above,

- ✓ I find that this project **may affect and is likely to adversely affect**:
  - Mexican spotted owl
  - Mexican spotted owl critical habitat

June 19, 2019

Noel Fletcher
Wildlife Biologist
Prescott National Forest

Based on the effects analyses above,

- ✓ I find that this project **may affect and is not likely to adversely affect**:
  - Gila trout

/s/ 

March 27, 2019

Albert Sillas
Fisheries Biologist
Prescott National Forest

Appendix A: Resource Protection Measures

A. Wildlife - Excerpted to include those relevant to MSO & its habitat

C-1. As the location of previously unknown threatened, endangered, or sensitive species dens or nests become known, they would be reported to a forest wildlife biologist and protected from disturbance by project implementation or design as per direction from the current species recovery or management plan and Guide-WL-1 and Guide-WL-2 in the Forest Plan.

C-2. For cavity nesting birds, snags should be retained at levels indicated in potential natural vegetation type desired condition statements, if available, and replaced at natural recruitment rates (Guide-WL-4).

C-3. For Mexican spotted owls:

a. Breeding season timing restrictions would apply to all Mexican Spotted Owl Protected Activity Centers unless determined to be non-nesting status through formal monitoring protocol. No activities may occur within designated Mexican Spotted Owl Protected Activity Centers from March 1 to August 31 each season unless formal monitoring determines the protected activity centers to be in non-nesting status. Per the Prescott Land and Resource Management Plan Biological Opinion from U.S. Fish and Wildlife Service, this breeding season timing restriction would extend a 0.25 mile beyond the boundary of each Mexican Spotted Owl Protected Activity Center. Where there is a breeding season timing restrictions, activities associated with treatments may occur September 1 to February 28 each season.

b. Management recommendations in the Mexican Spotted Owl Recovery Plan would be considered when developing all proposed actions or vegetation treatments within Mexican spotted owl habitats, both protected and recovery habitats (Guide-WL-1).

c. We recognize there may be areas and circumstances where large trees need to be removed to achieve restoration goals. It may be necessary for the removal of large trees in order to meet community protection and public safety goals, as well as in sites where ecological restoration and biodiversity objectives cannot otherwise be met. Such situations include but are not limited to wet meadows; seeps; springs; riparian areas; aspen groves or oak stands; within-stand openings; and heavily stocked stands with high basal area generated by a preponderance of large, young trees; and to reduce forest health risks including bark beetle and dwarf mistletoe. In certain areas, the landscape is missing younger, small trees as well as larger, older trees and prescriptions to recruit and enhance these desired age classes may require removal of large trees in some instances. It may also be necessary to remove a few larger trees for operational feasibility so that operators can move equipment through treatment areas in order to implement thinning and preclude damage to the residual stand.

B. Hydrology and Watershed Resources – Relevant to Fisheries

A-3. Treatment footprints should integrate mosaic patterns that mimic cover and/or density levels identified in the Forest Plan PNVT descriptions. This would create vegetative age-class diversity, buffer accelerated soil loss, and mitigate accelerated runoff and sedimentation. For specific cover and structure values, the Prescott National Forest Terrestrial Ecological Unit Inventory (TEUI) and Ecological Classification would be used.

A-4. Burn severity prescriptions should correlate to Forest Plan desired conditions by PNVT. Strategies of applying high burn severity should be conducted in patchy, non-continuous patterns that are buffered with unburned vegetation or areas subjected to low-burn severity.

G-1. When developing implementation and treatment plans a streamside management zone (SMZ)[4,5] map should be developed and used to help identify treatment strategies. The

G-2. Retain a diversity of tree species and age classes in the SMZ. Keep enough mature trees to avoid potential regeneration problems.

G-3. Clearly designate vegetation to be treated in the SMZ, and maintain riparian vegetation within the SMZ.

G-4. Do not identify treating facultative or obligate riparian vegetation in the SMZ.

G-5. Leave sufficient vegetation to provide bank stabilization, shade, and a future source of large woody debris.

G-6. Avoid broadcast burning in the SMZ unless specifically identified as the proper management treatment. Minimize and avoid application of high and moderate burn severity in the SMZ.

G-10. Maintain sufficient ground cover within the SMZ to trap sediment before it enters any watercourse.

H-1. All management treatments would be designed in a manner that minimizes soil disturbances and facilitates implementation of best management practices. Obtain a terrestrial ecosystem survey map for guidance of site-specific best management practices in applicable PNVTs, which corresponds with project level terrestrial ecosystem survey map units. Map units correspond with the Terrestrial Ecosystem Survey

[4] The streamside management zone (SMZ) is an area or strip of land adjacent to a stream or other body of water where management practices are planned and implemented in a manner that protects water quality, aquatic wildlife and wildlife habitat. Trees and vegetation within the SMZ serve as a natural filter to keep sediment out of a stream, reduce soil erosion, and buffer the stream from damage caused by nearby management activities such as harvesting of timber, vegetation treatment, and road construction or prescribed burning. The SMZ is not a zone of exclusion where all activities are precluded, but because of the need to protect water quality and other values, the SMZ is an area where activities should be carefully managed.

[5] A SMZ is also referred to as the aquatic management zone (AMZ). An AMZ is an administratively designated zone adjacent to stream channels and other waterbodies. Special management controls aimed at maintaining and improving water quality or other water- and riparian-dependent values, including groundwater-dependent ecosystems, should be applied in the delineated AMZ. The width of the AMZ is determined based on site-specific factors and local requirements. AMZ delineation may encompass the floodplain and riparian areas when present. AMZ designation can have synergistic benefits to other resources, such as maintaining and improving aquatic and riparian area-dependent resources, visual and aesthetic quality, wildlife habitat, and recreation opportunities. National BMPs for Water Quality Management on National Forest System Lands (2012).

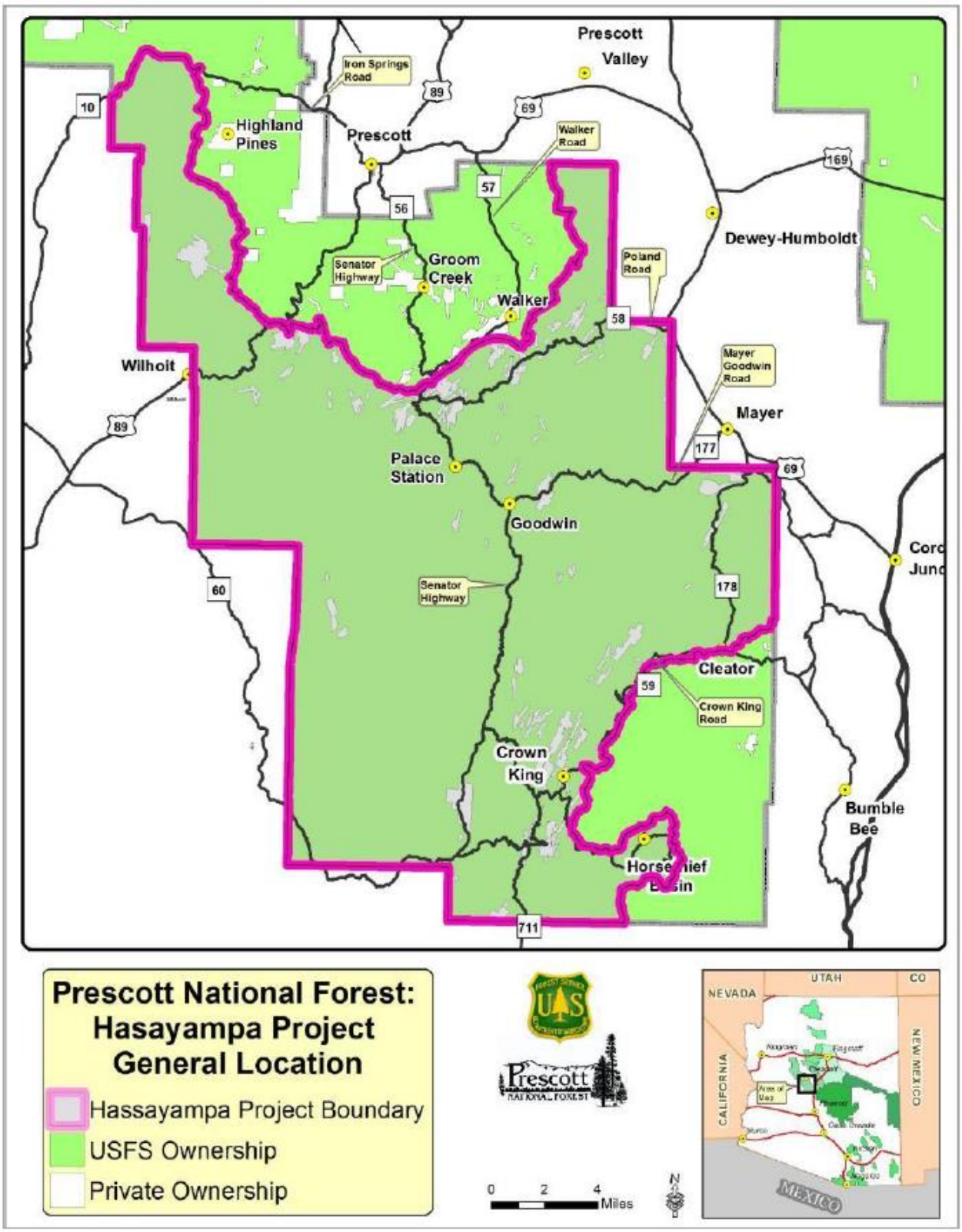
of the Prescott National Forest (2000). The terrestrial ecosystem survey includes potentials associated with climate, vegetation, and soils.

H-5. Prescribed fire planning measures on slopes 40 percent and greater would take steps to mitigate soil impacts and minimize accelerated erosion. Examples may include evaluating different ignition strategies, minimizing burn severity, creating larger unburned mosaics, back burning, and ensuring full consumption of ground cover does not occur.

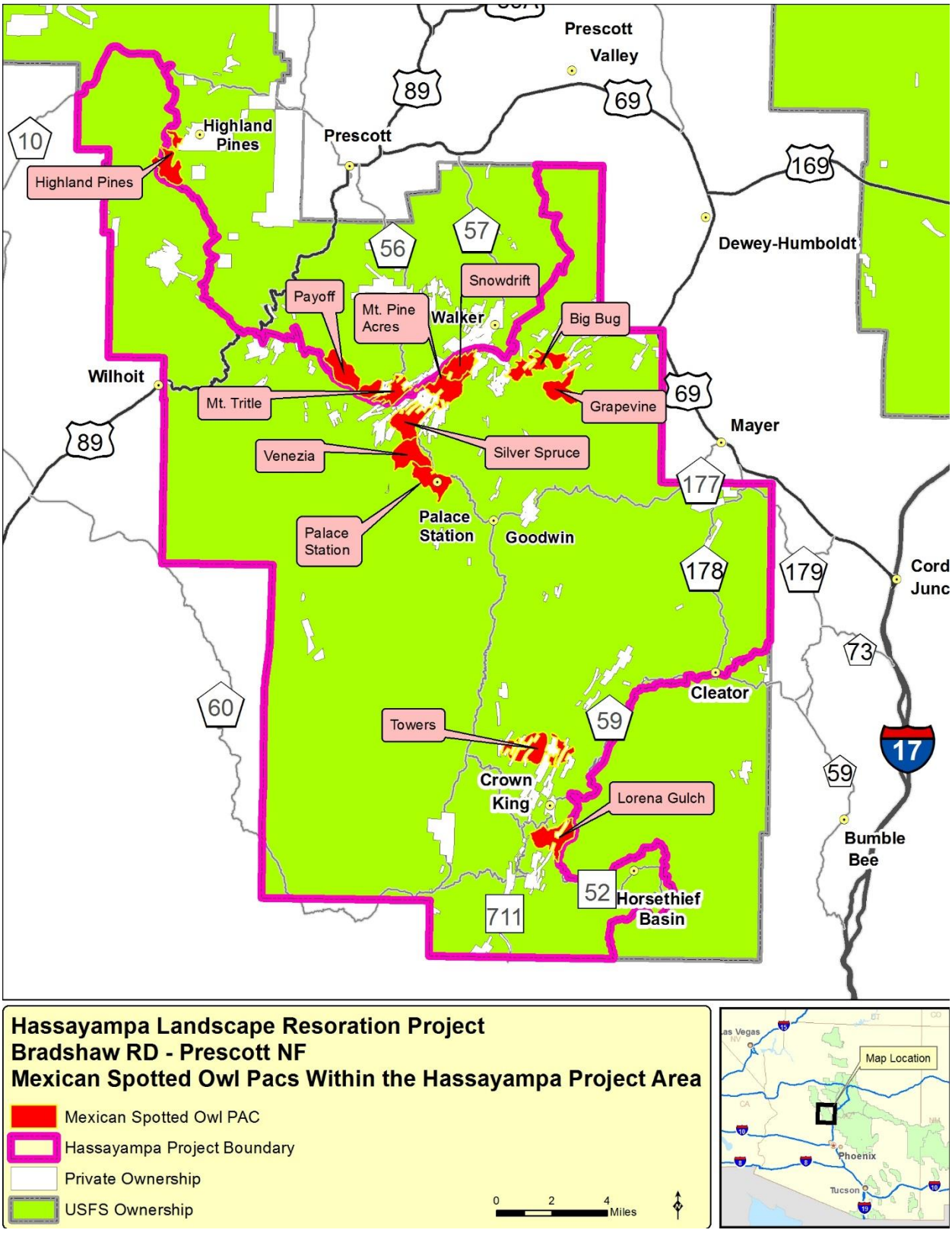
H-7. If treatment slash is chipped, optimal wood chip depth is 1 to 2 inches and should not exceed 3 inches

Appendix B: Maps

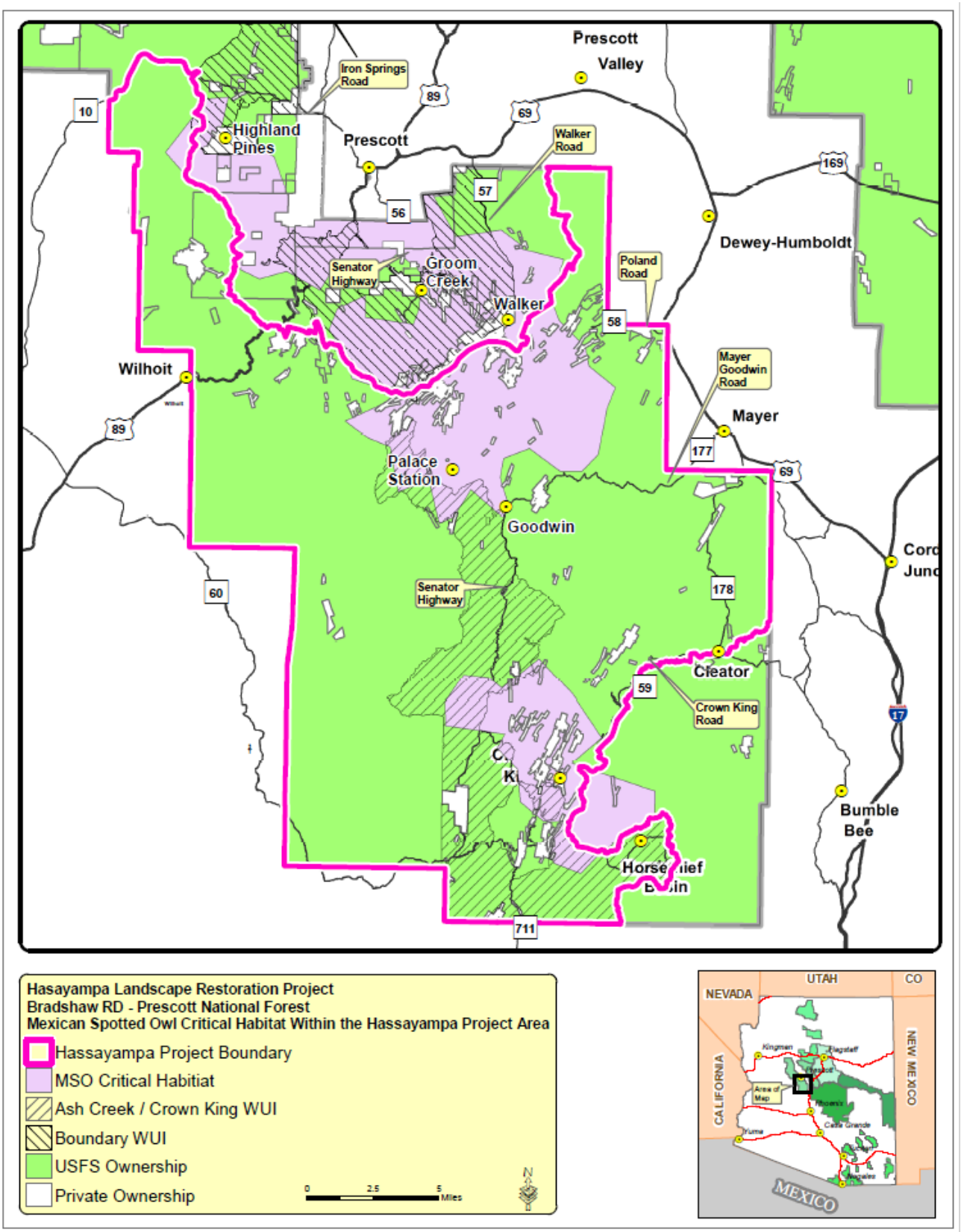
Maps begin on the following page.



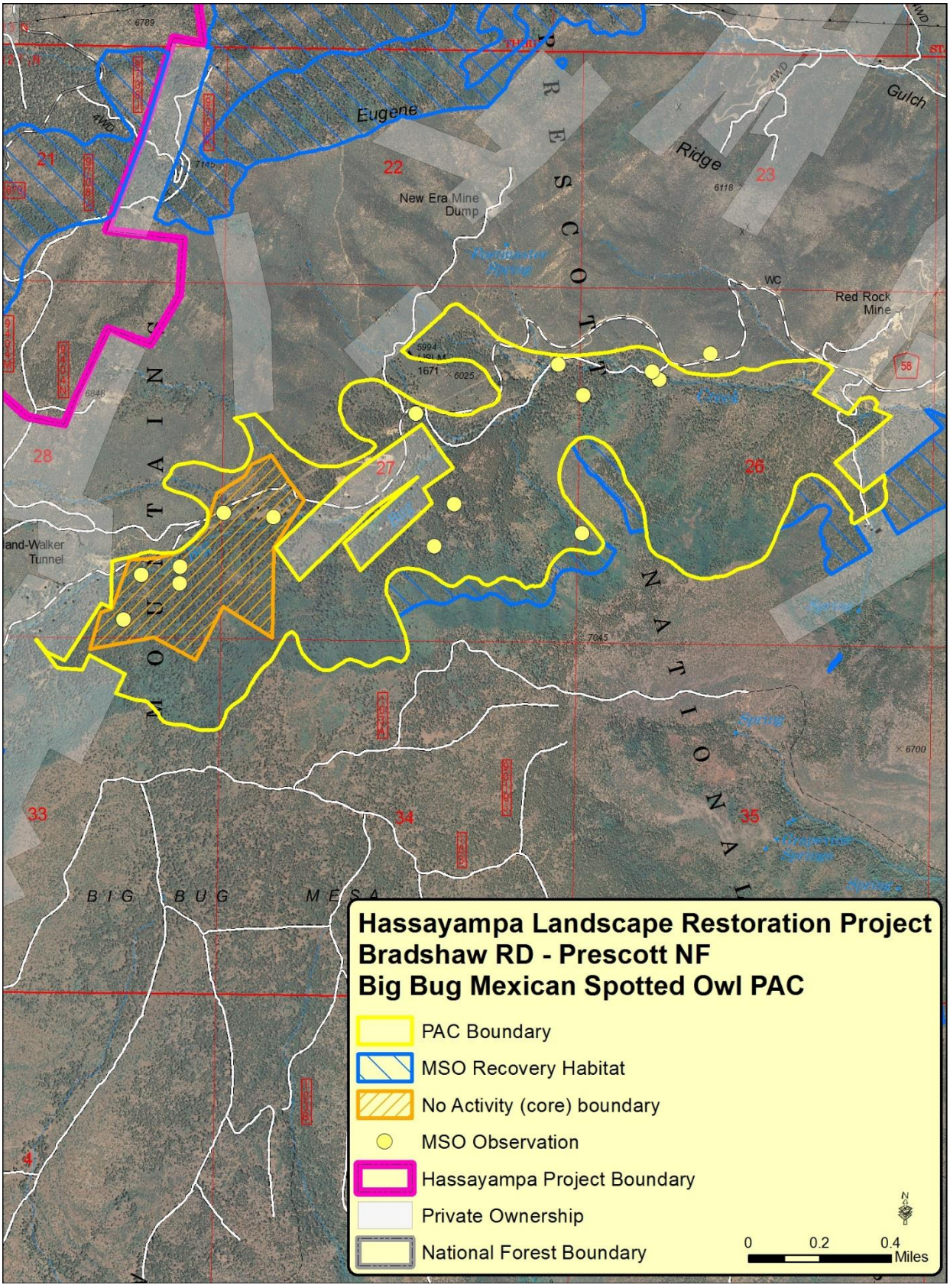
Map 1. Hassayampa Project vicinity map.



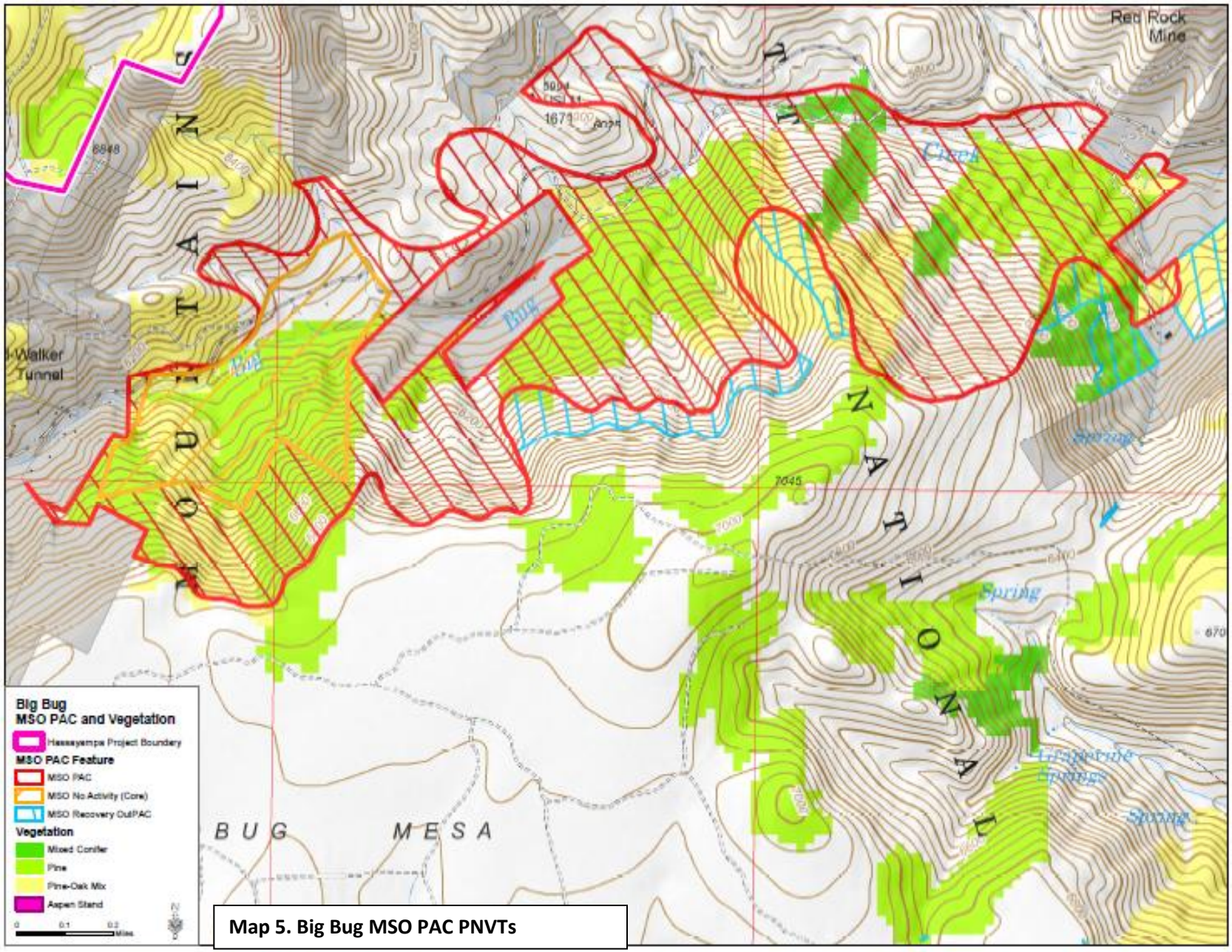
Map 2. Mexican spotted owl PACs within the Hassayampa Project area



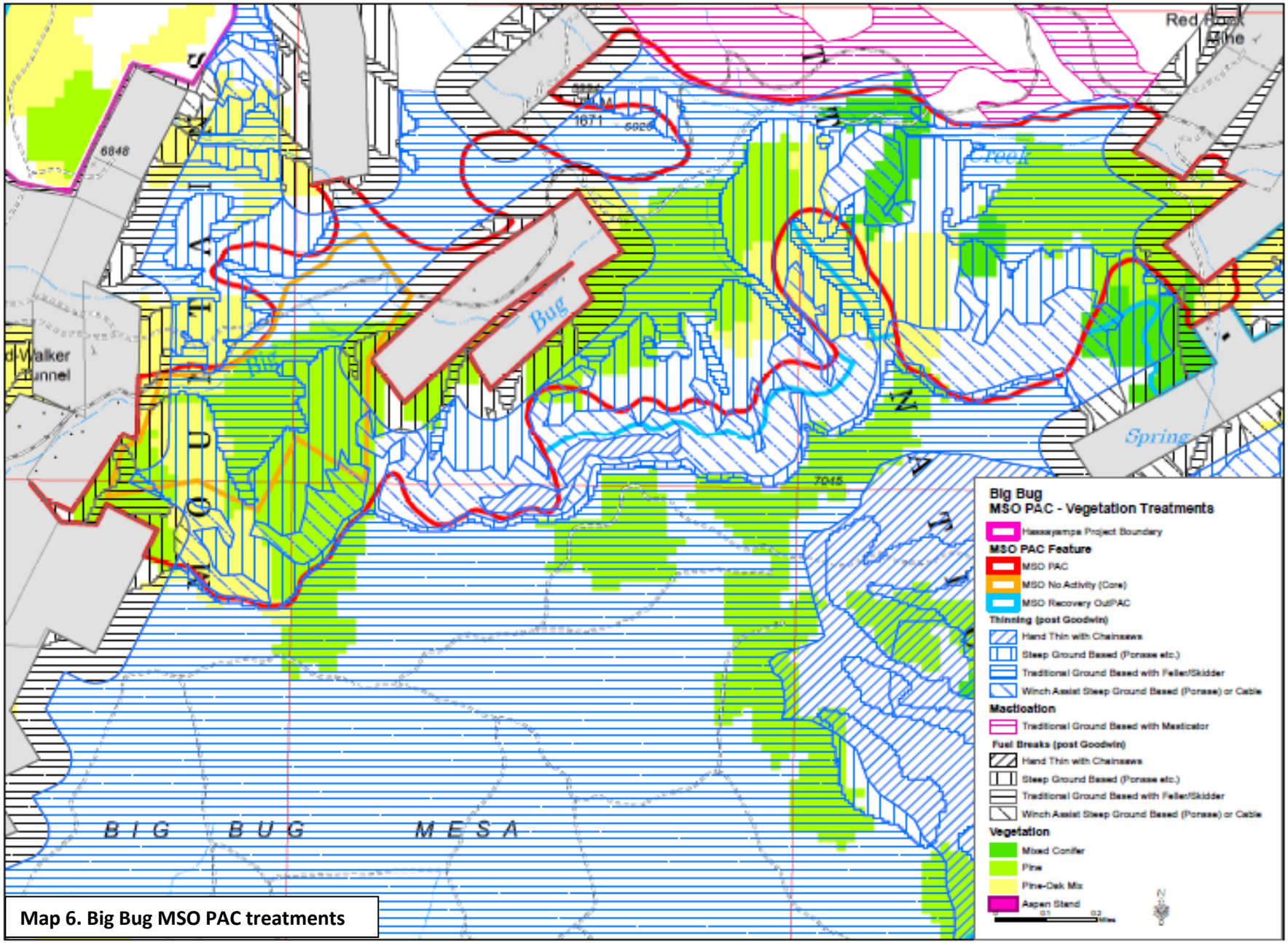
Map 3. Mexican spotted owl critical habitat within the Hassayampa Project area



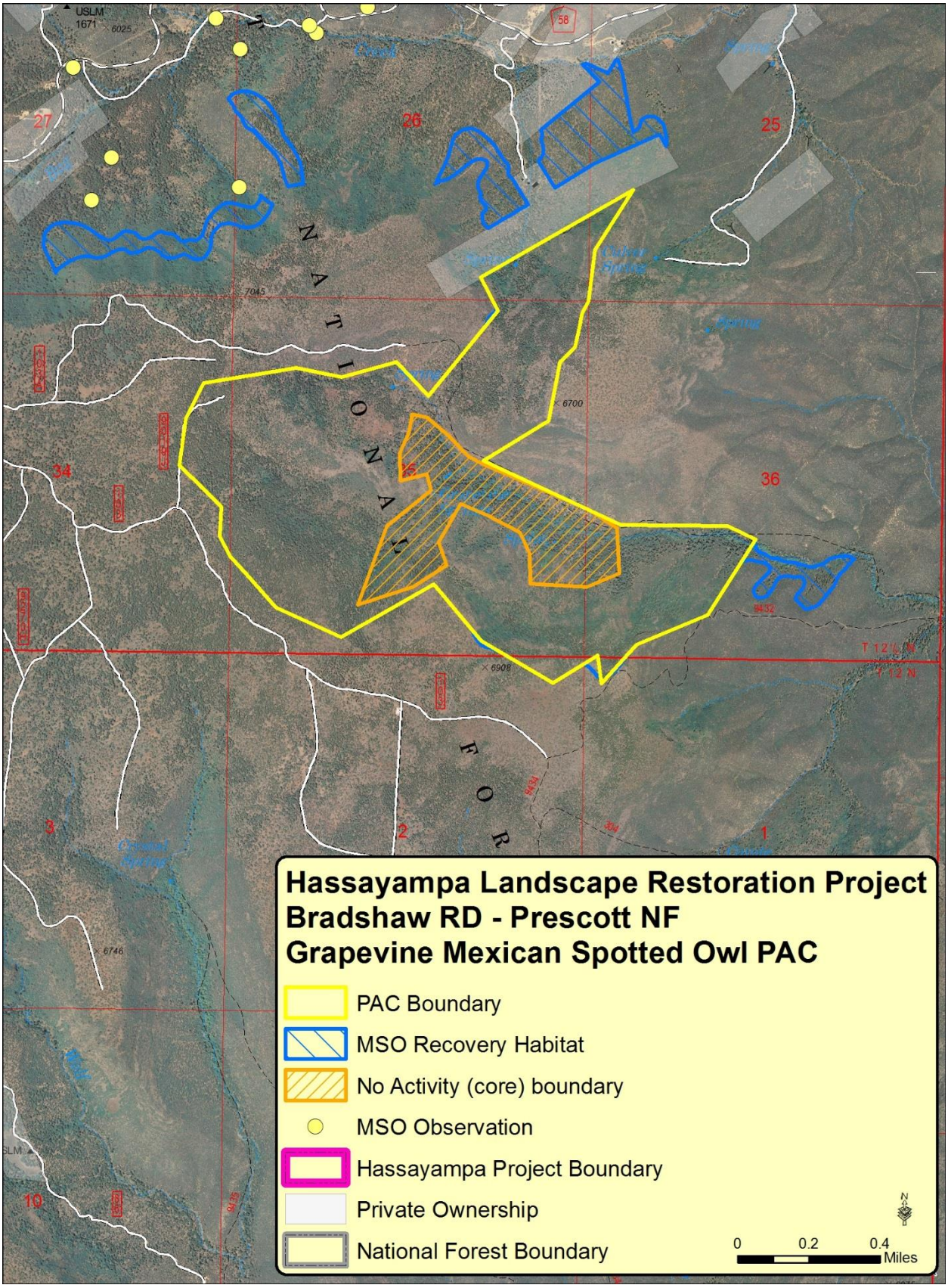
Map 4. Big Bug Mexican Spotted Owl PAC



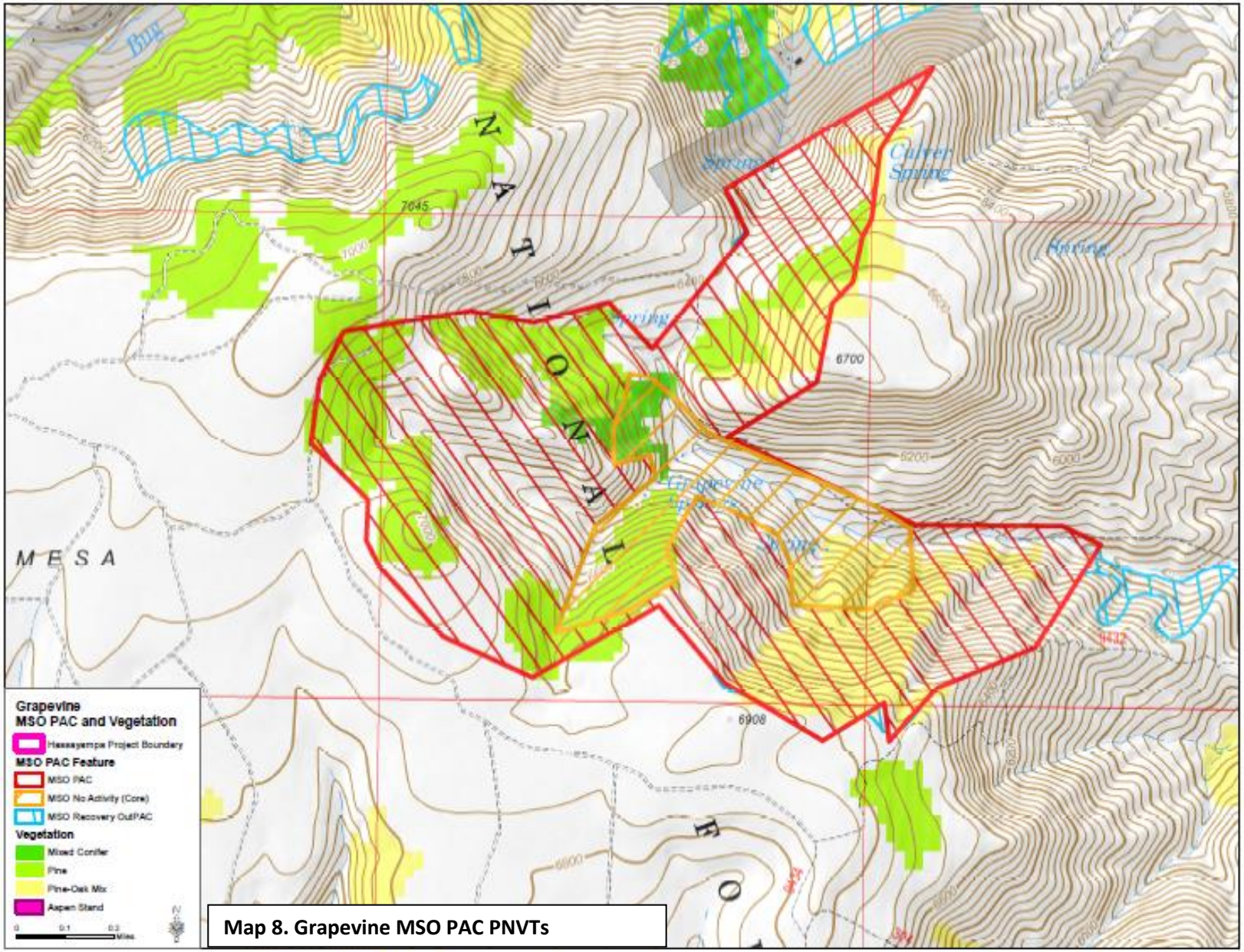
Map 5. Big Bug MSO PAC PNVTs



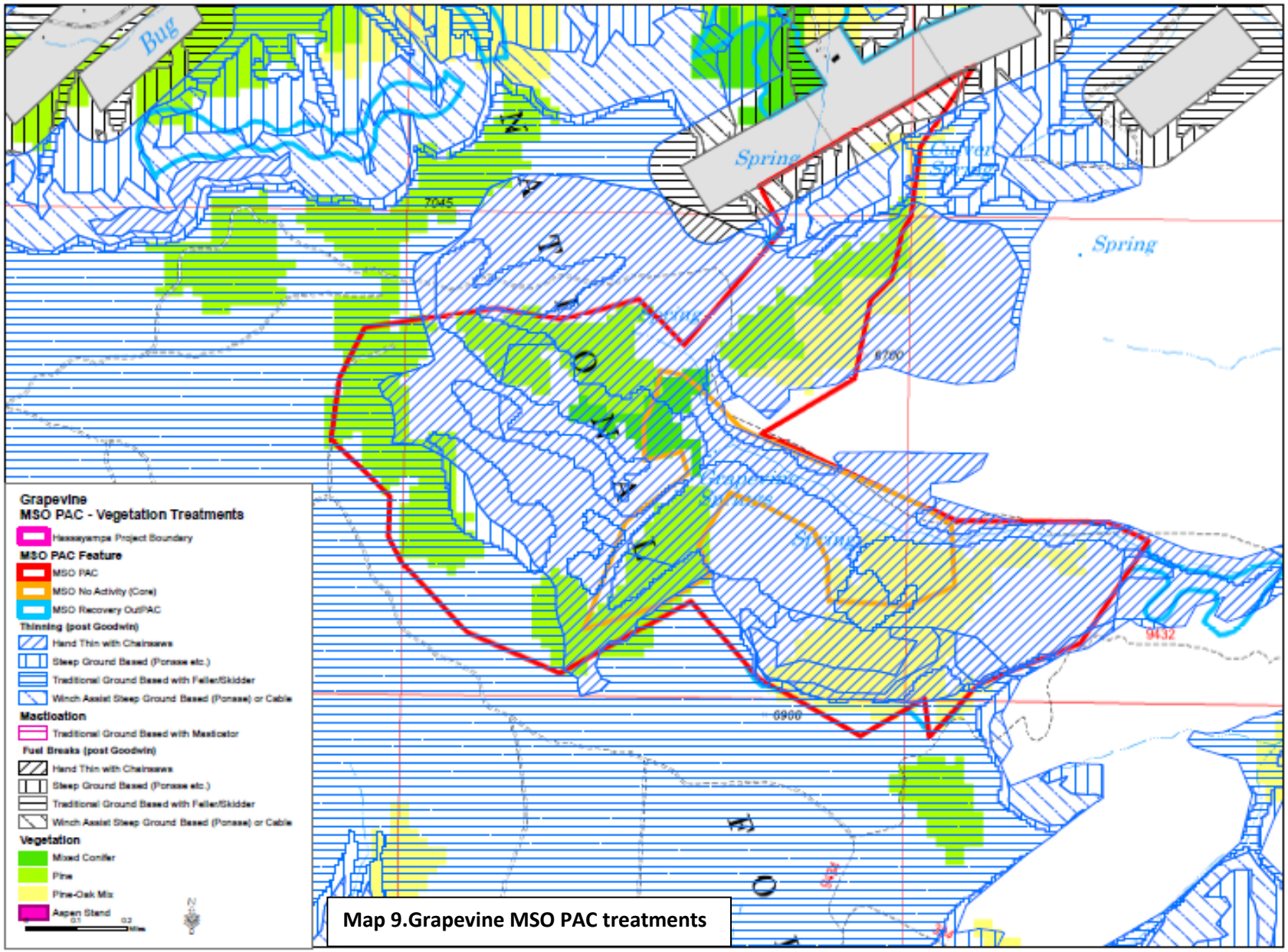
Map 6. Big Bug MSO PAC treatments



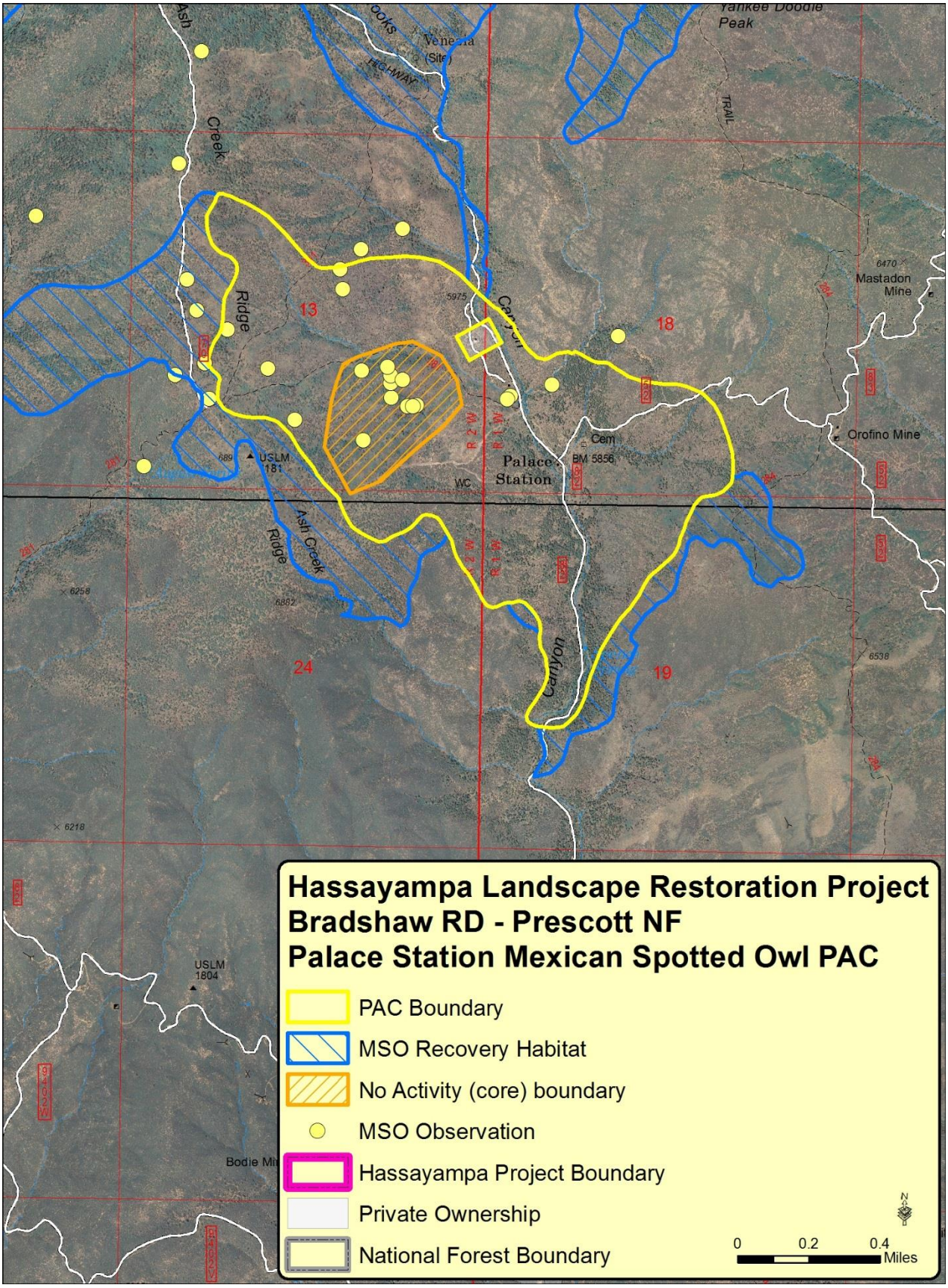
Map 7. Grapevine Mexican Spotted Owl PAC



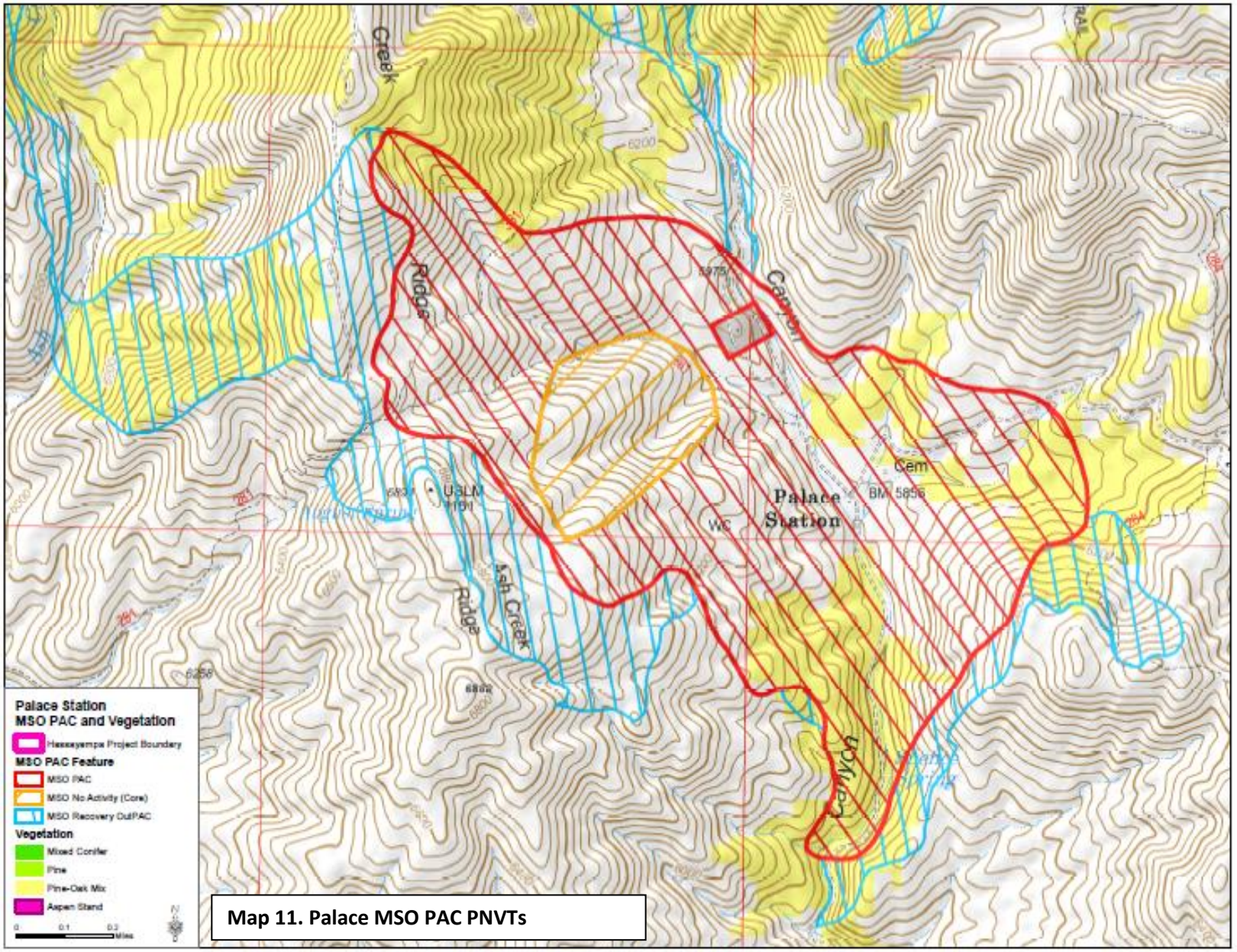
Map 8. Grapevine MSO PAC PNVTs



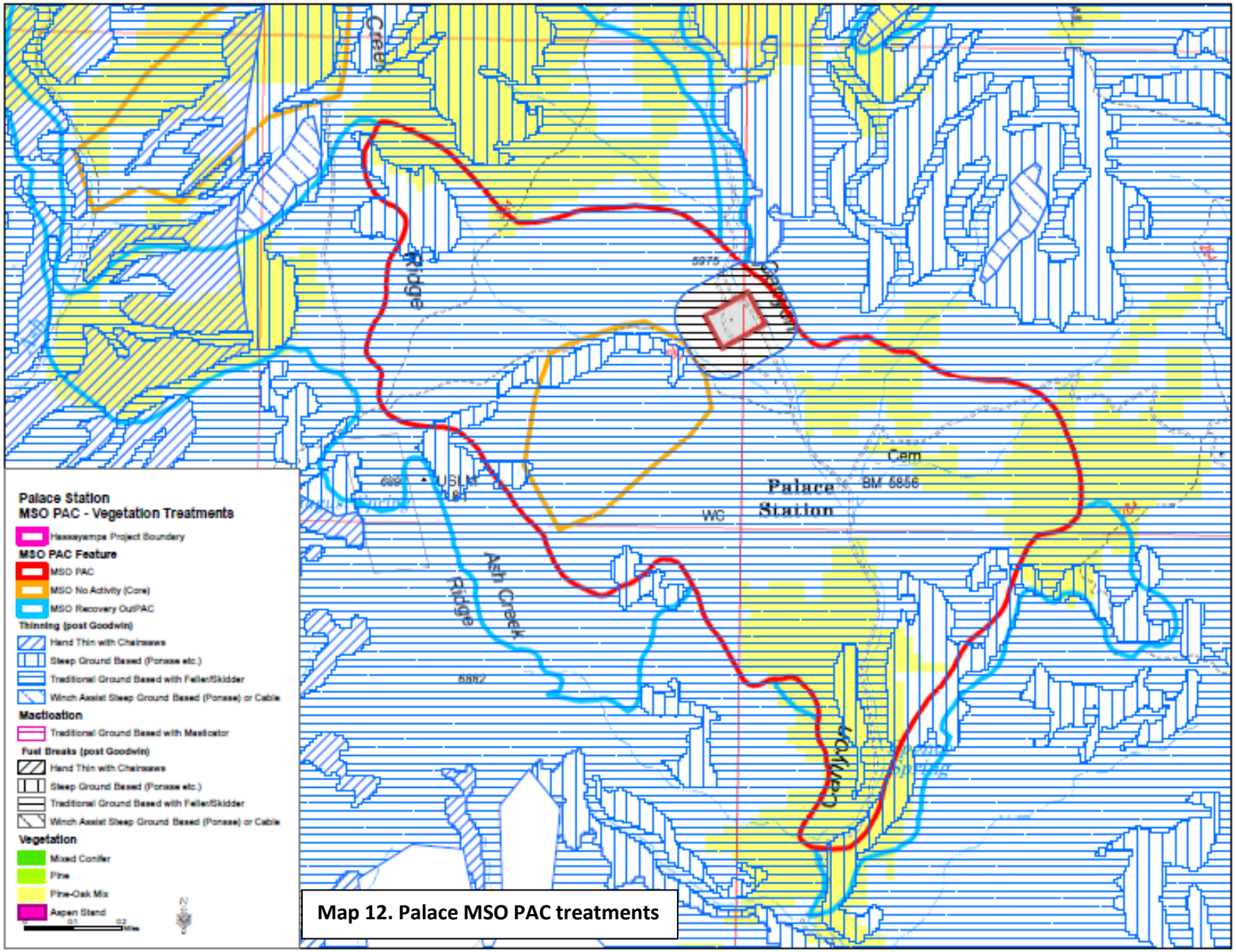
Map 9.Grapevine MSO PAC treatments



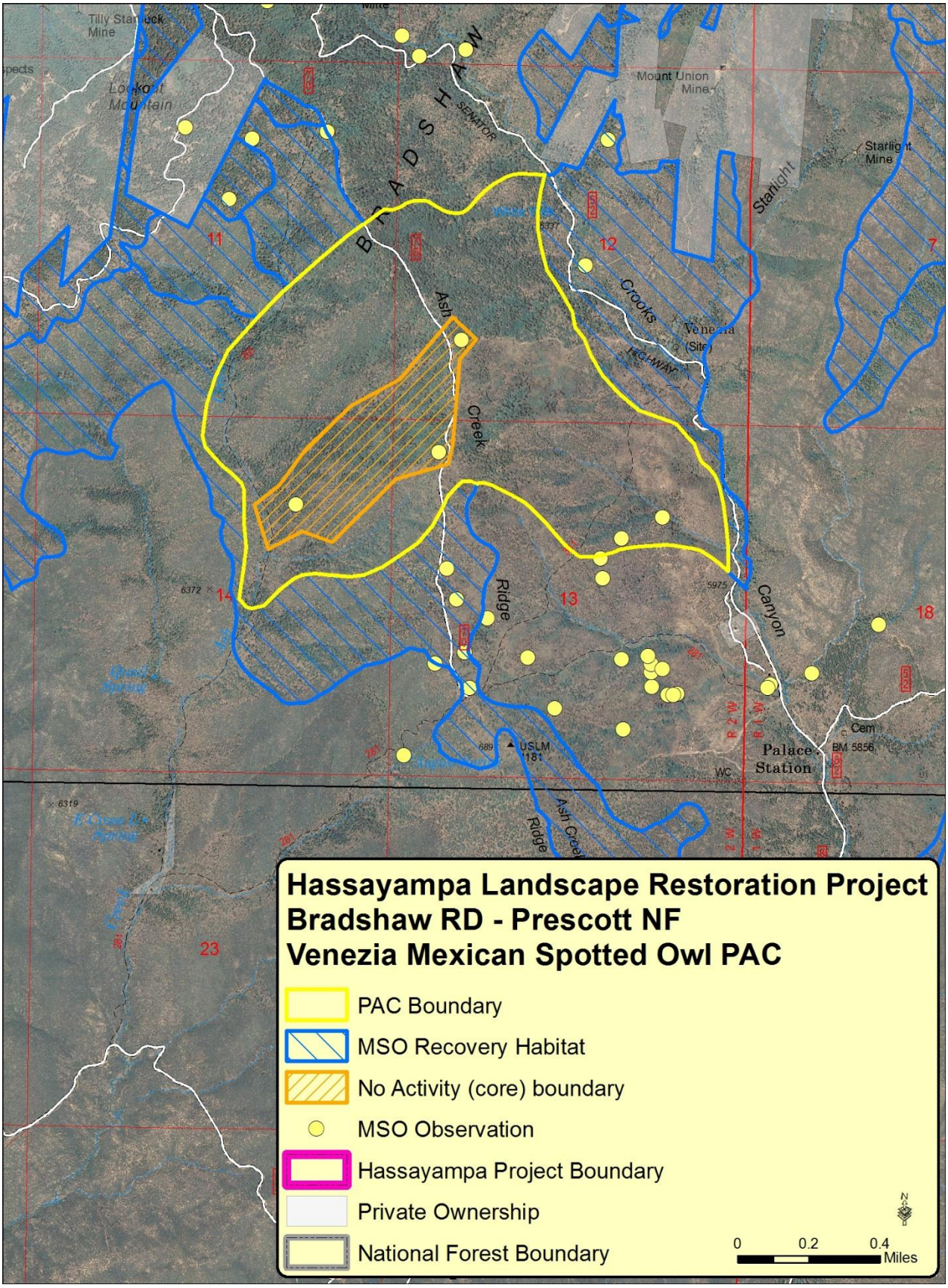
Map 10. Palace Station Mexican Spotted Owl PAC



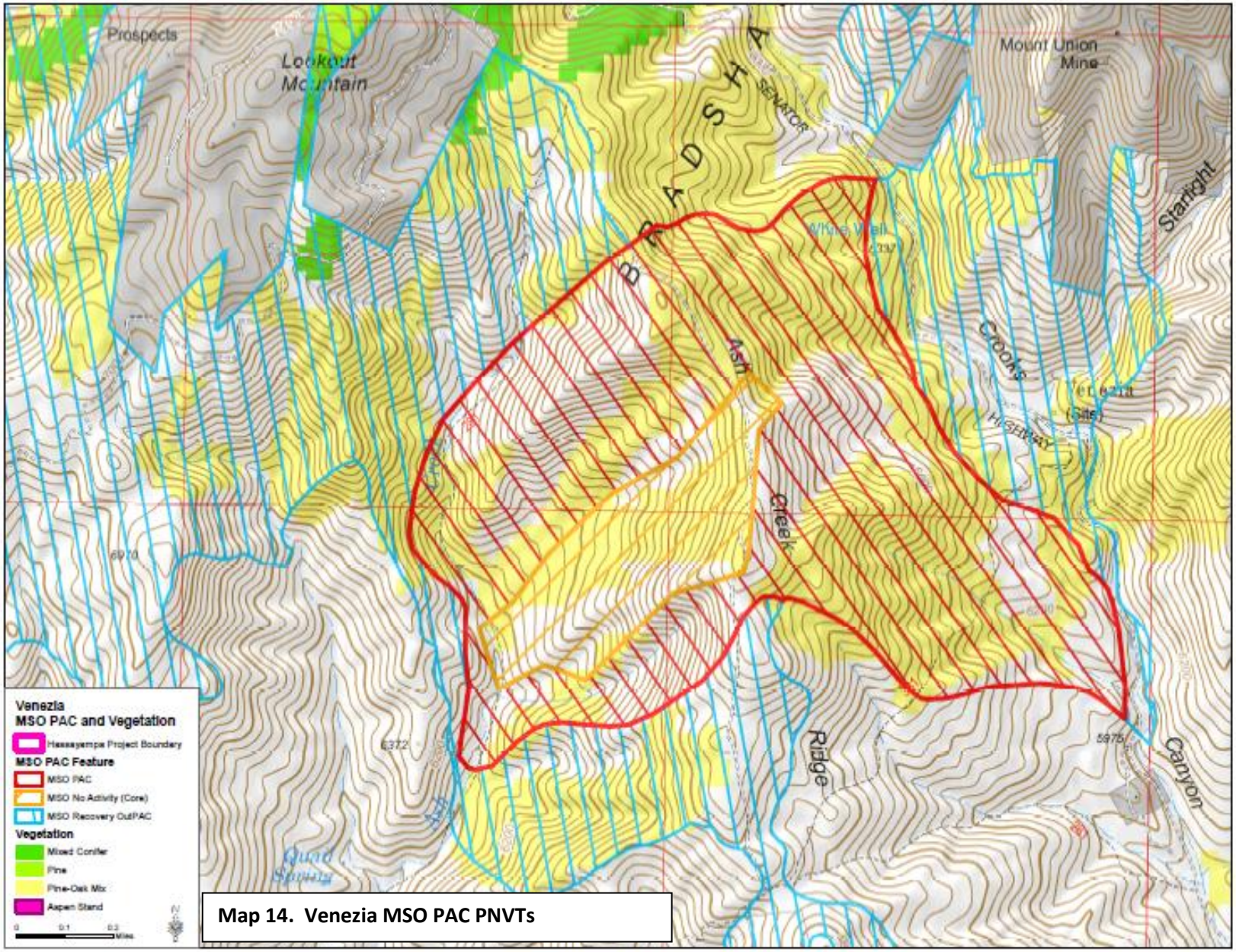
Map 11. Palace MSO PAC PNVTs



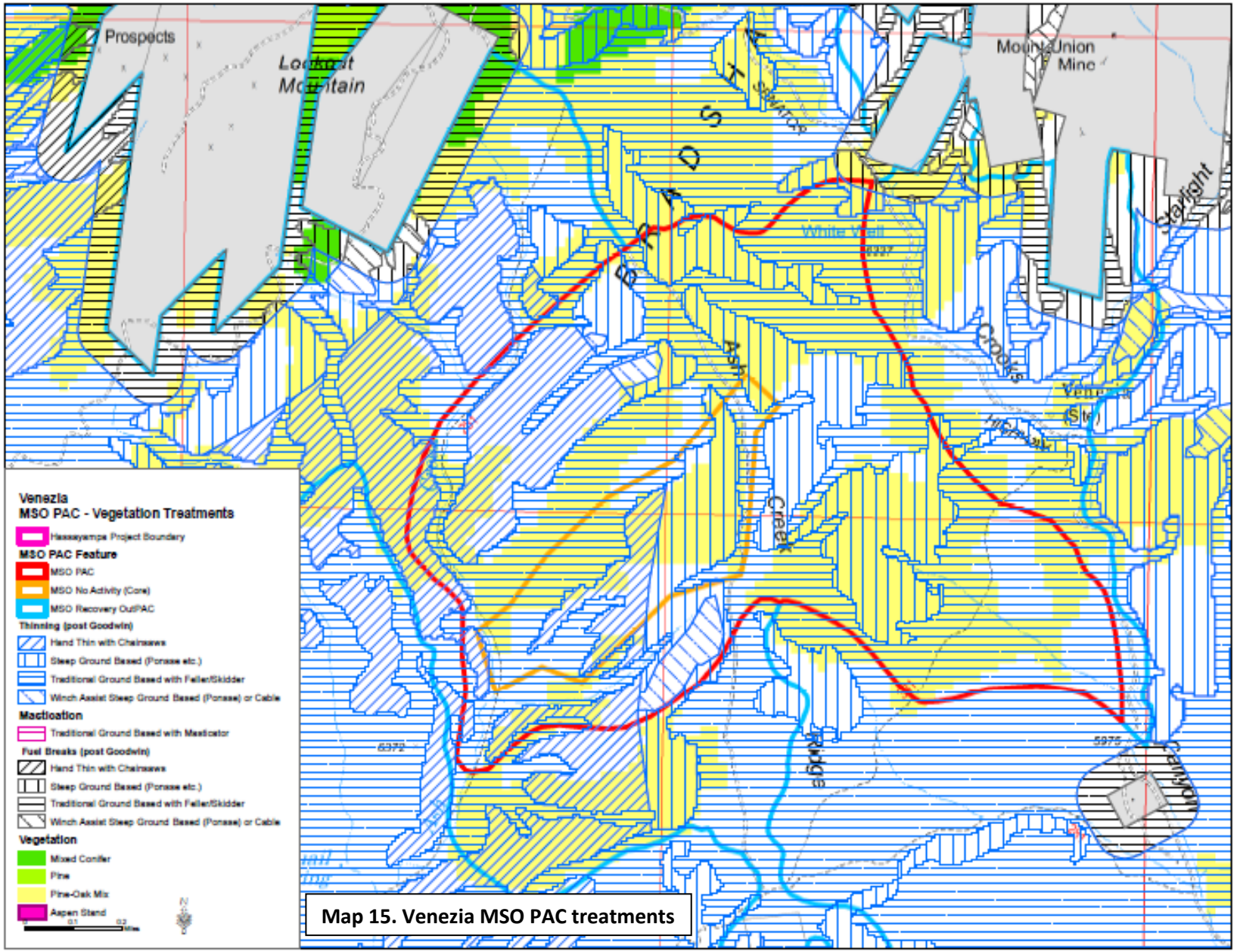
Map 12. Palace MSO PAC treatments



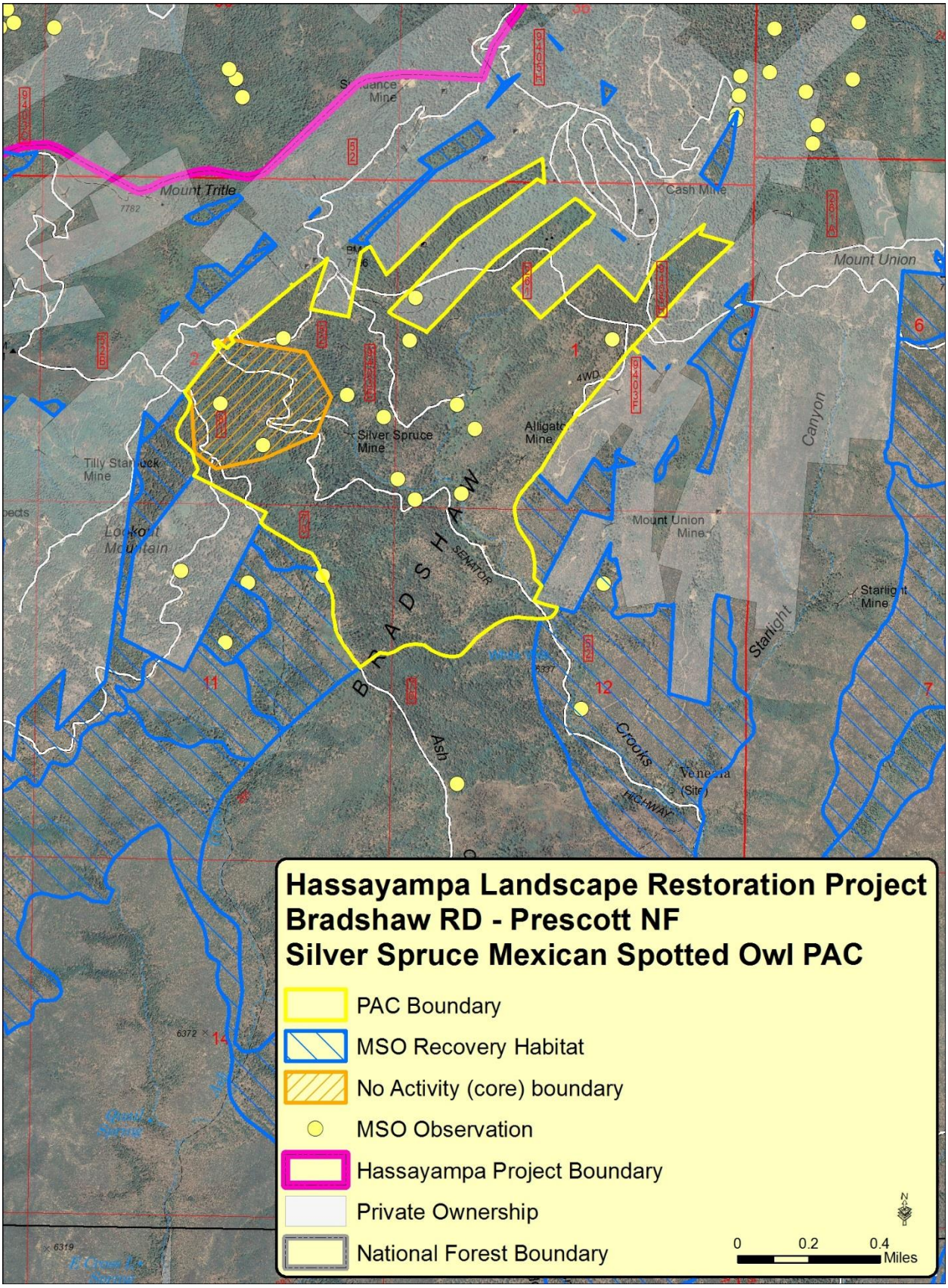
Map 13. Venezia Mexican Spotted Owl PAC



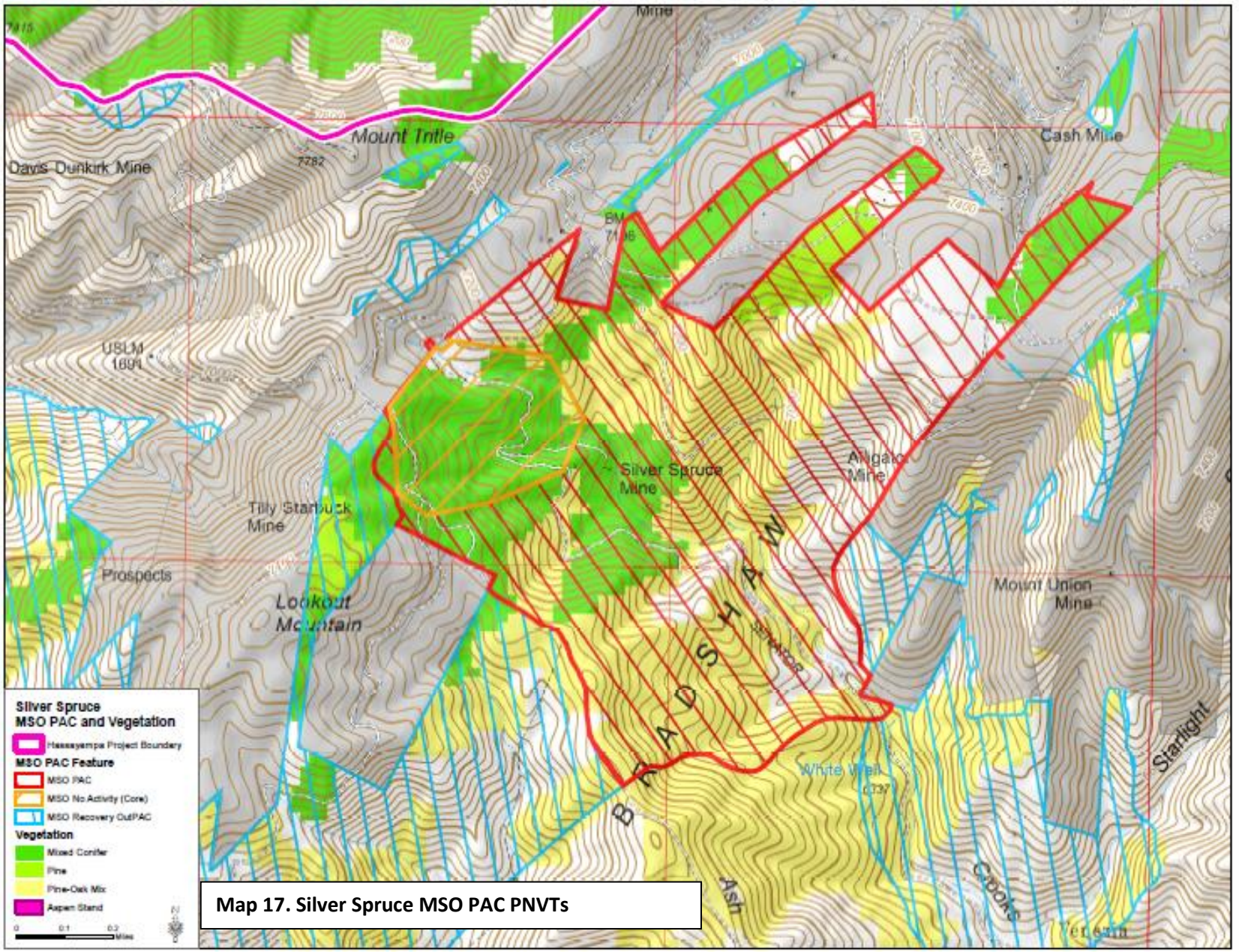
Map 14. Venezia MSO PAC PNVTs



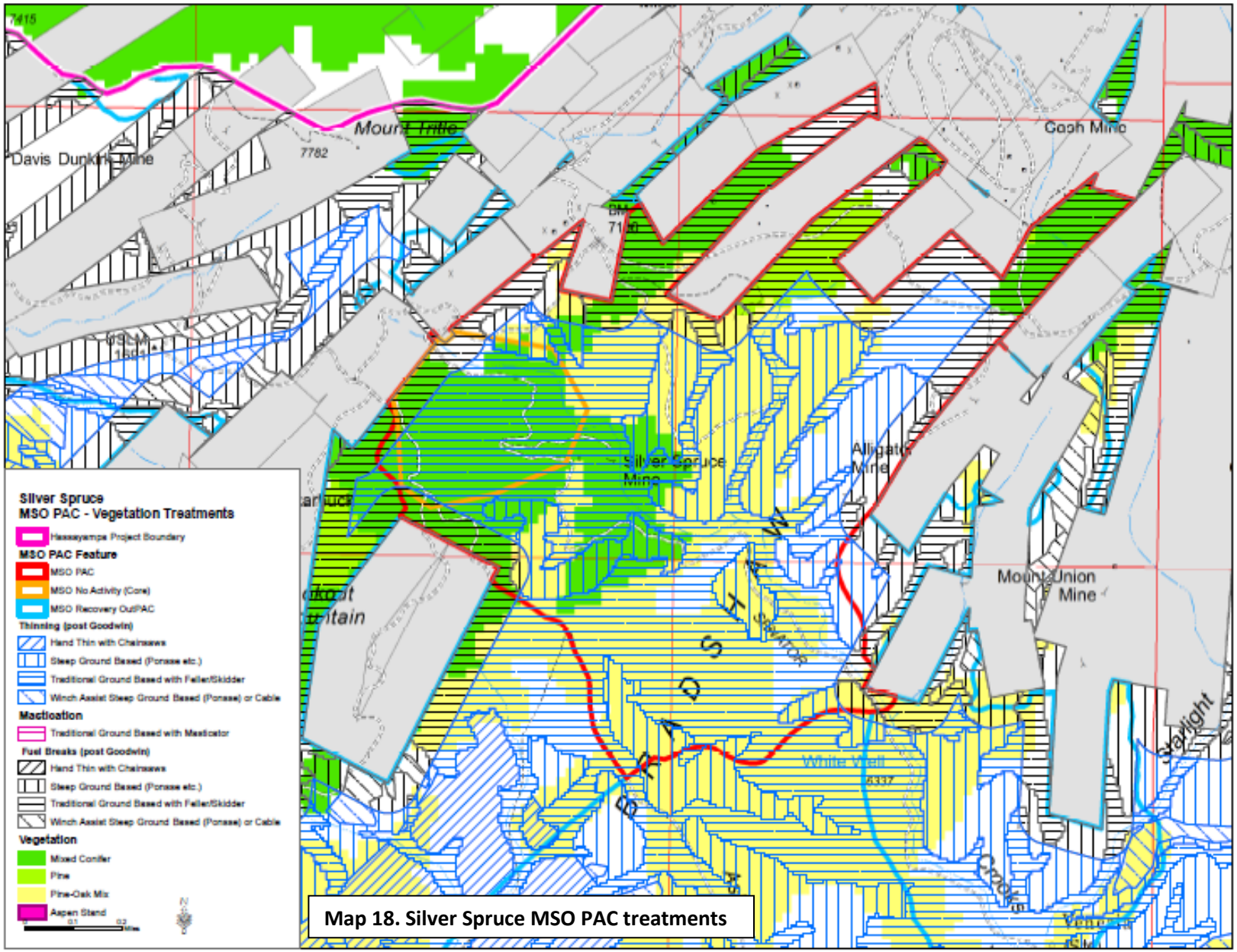
Map 15. Venezia MSO PAC treatments



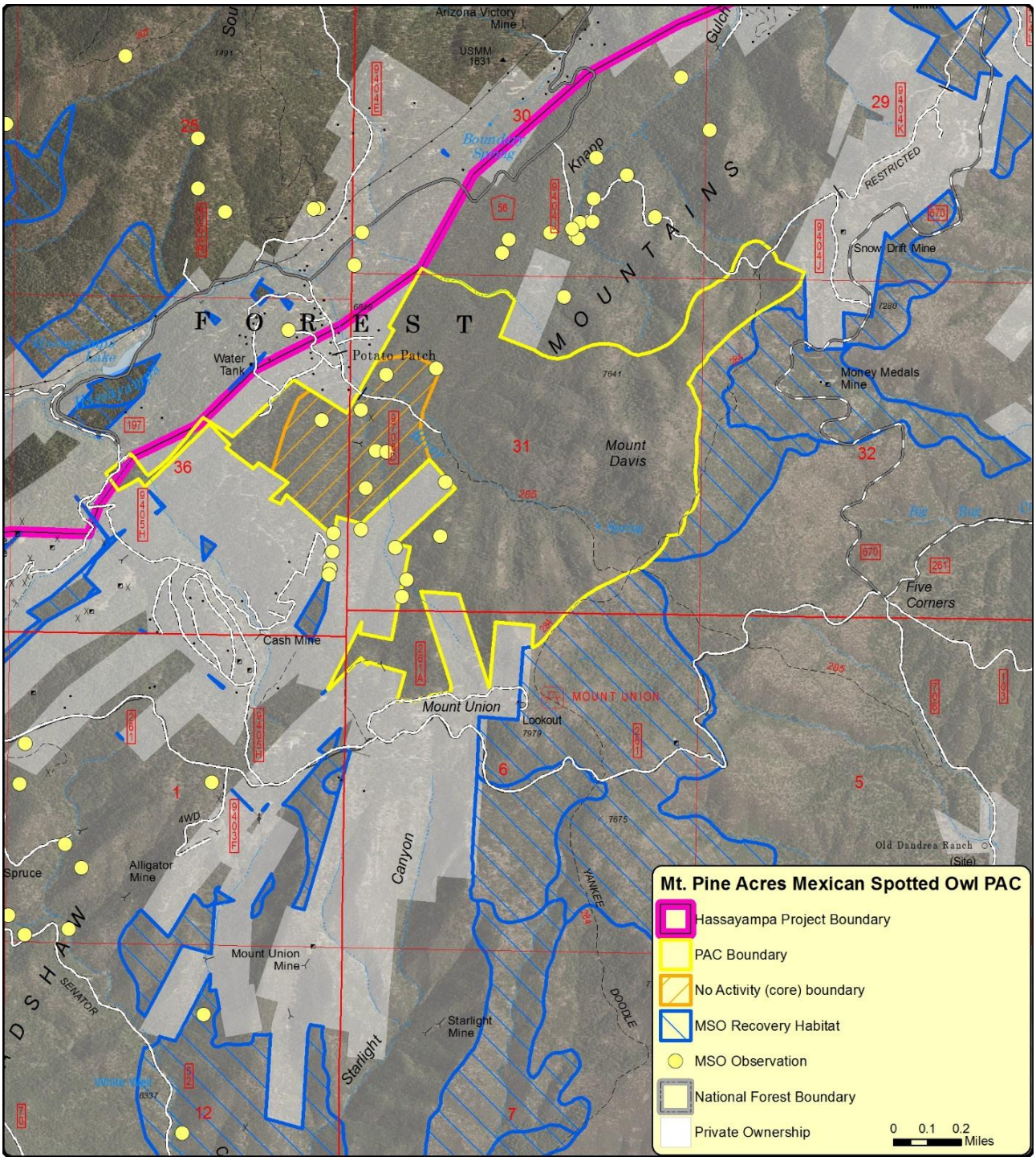
Map 16. Silver Spruce Mexican Spotted Owl PAC



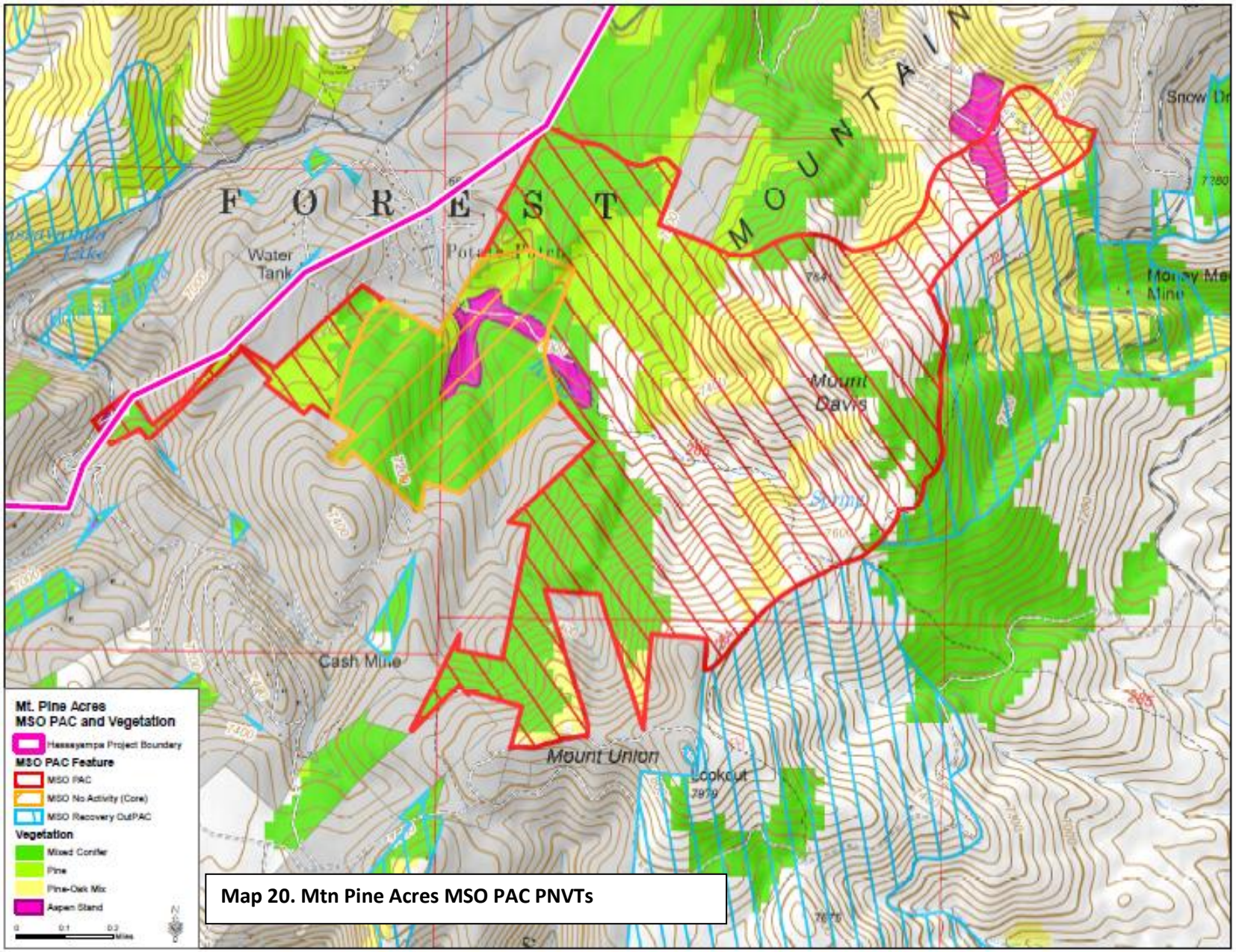
Map 17. Silver Spruce MSO PAC PNVTs



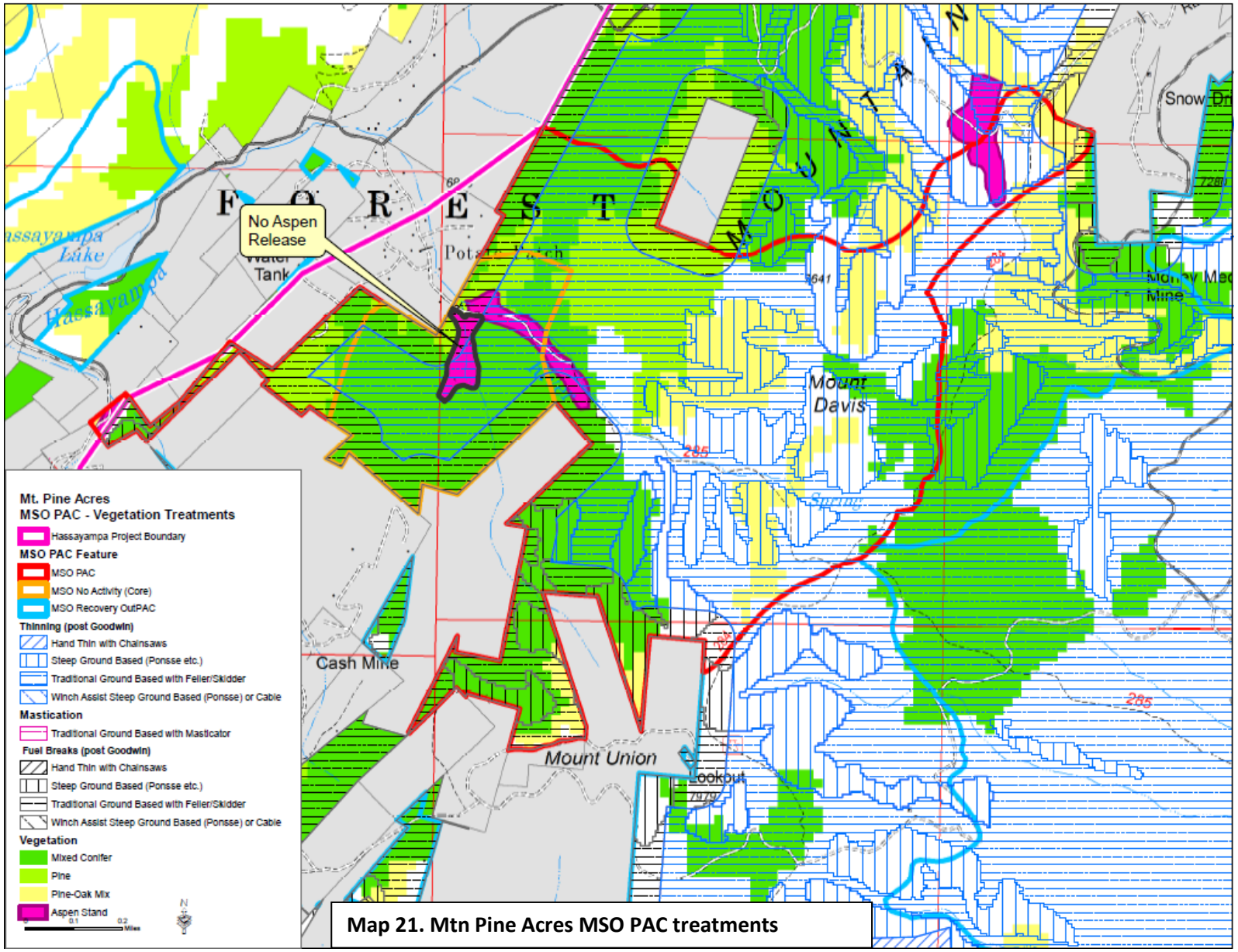
Map 18. Silver Spruce MSO PAC treatments



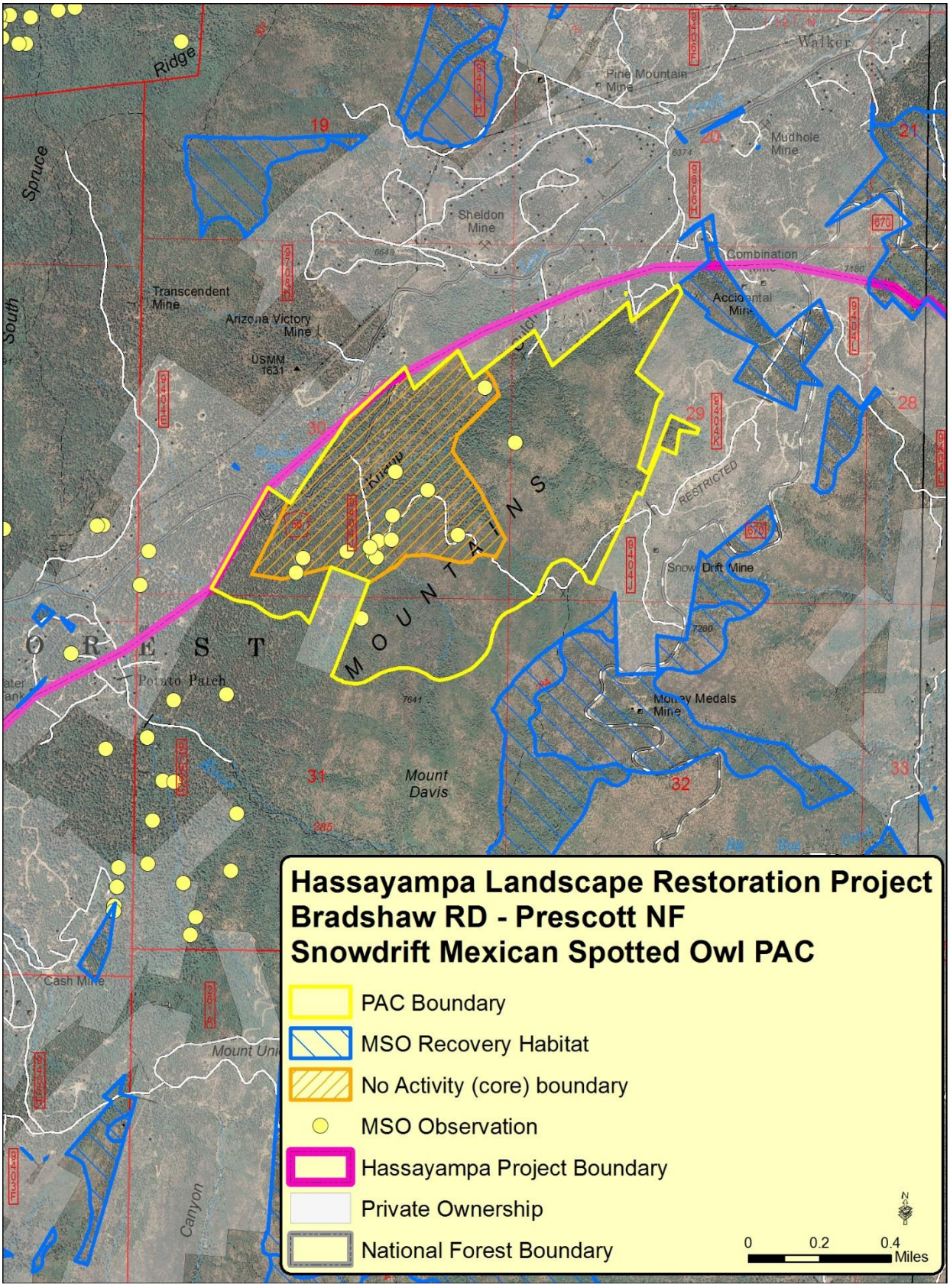
Map 19. Mt. Pine Acres Mexican Spotted Owl PAC



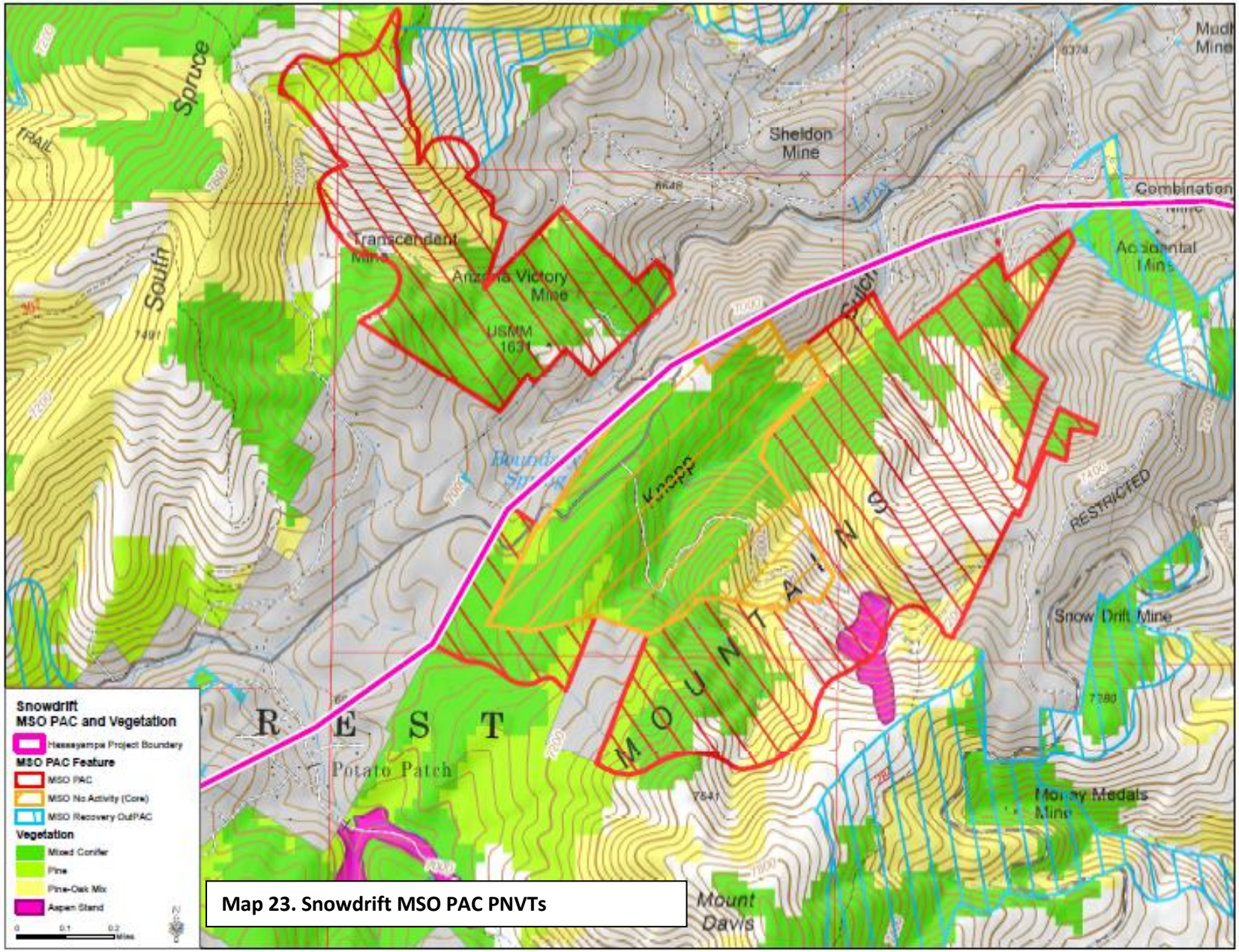
Map 20. Mtn Pine Acres MSO PAC PNVTs



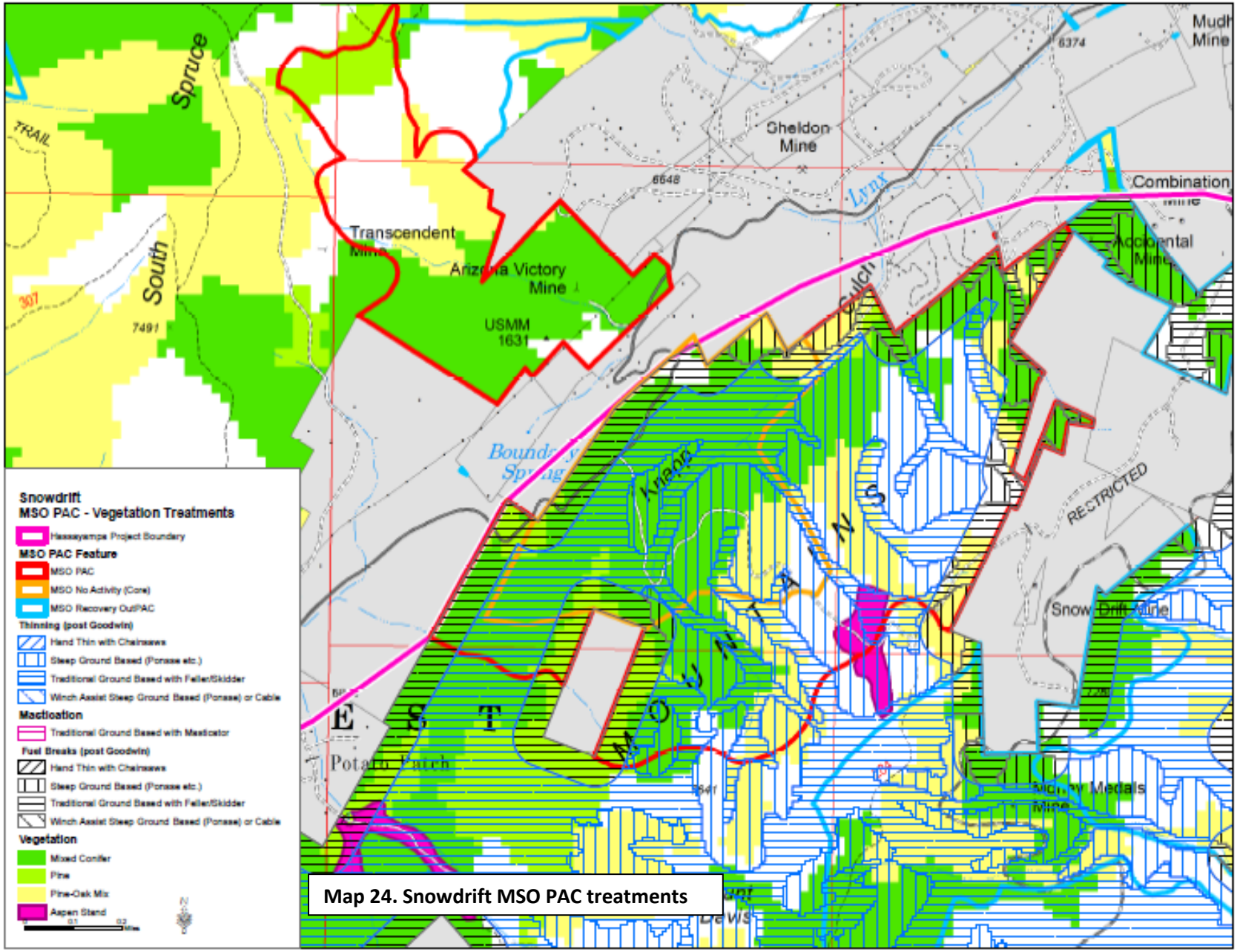
Map 21. Mtn Pine Acres MSO PAC treatments



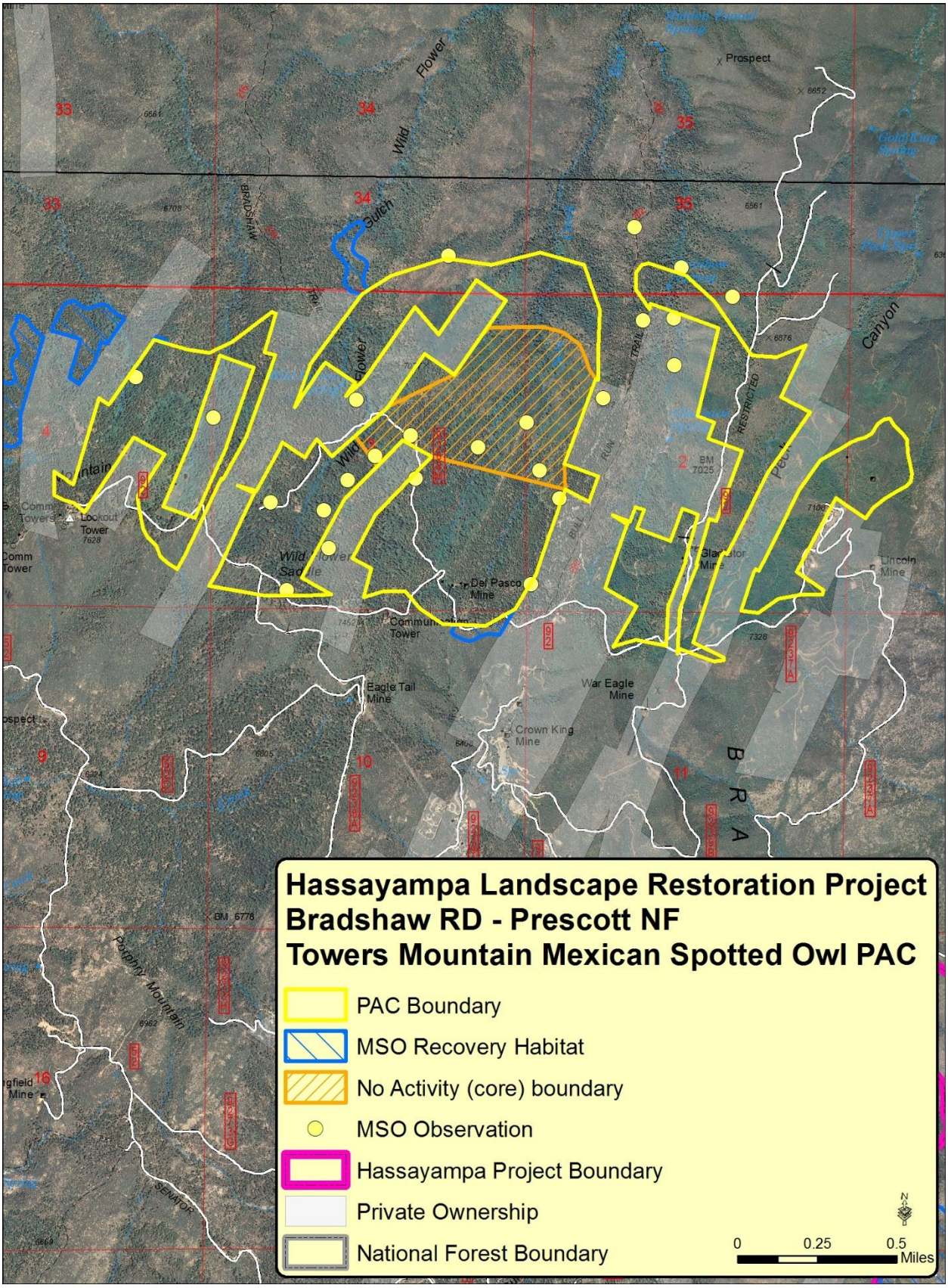
Map 22. Snowdrift Mexican Spotted Owl PAC



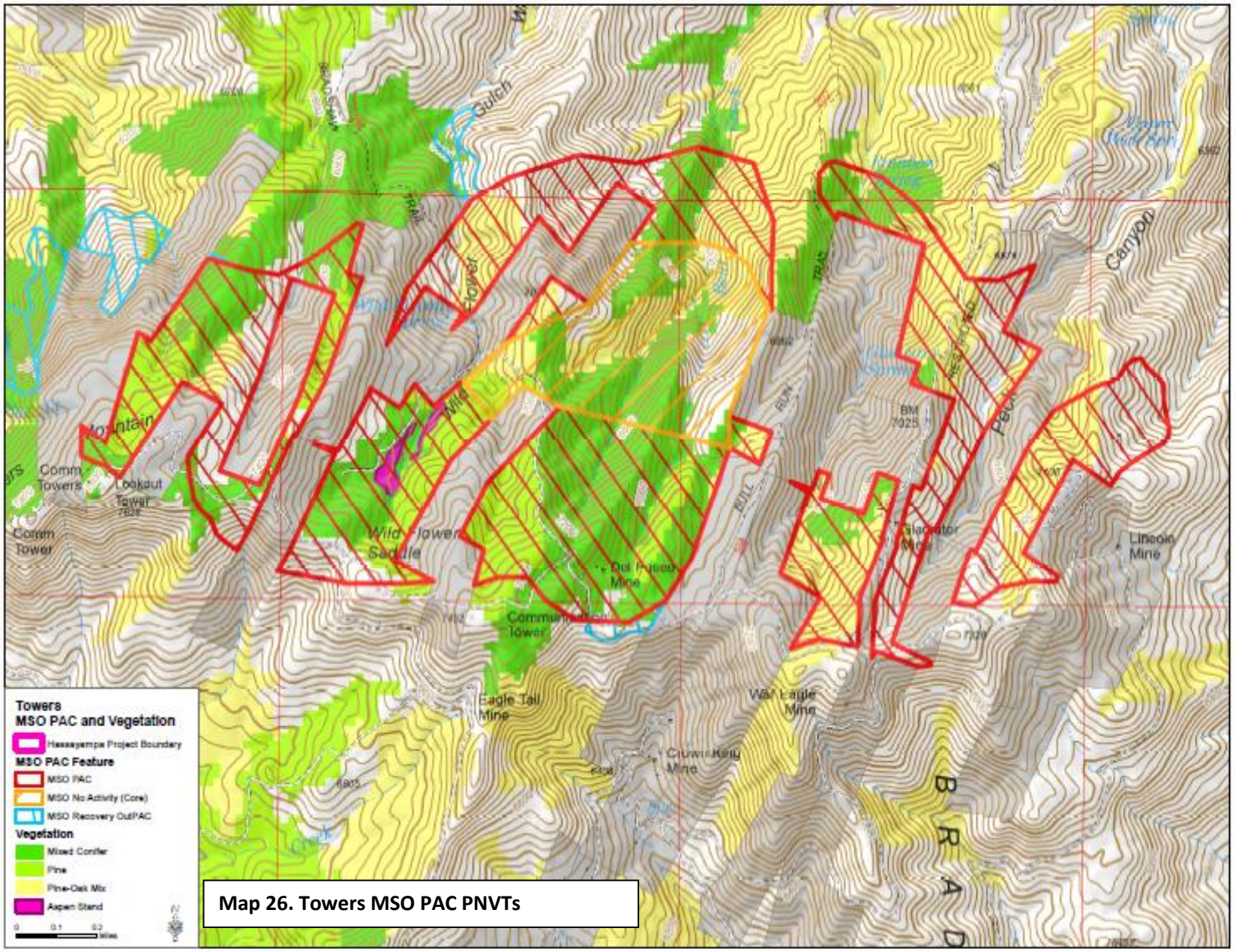
Map 23. Snowdrift MSO PAC PNVTs



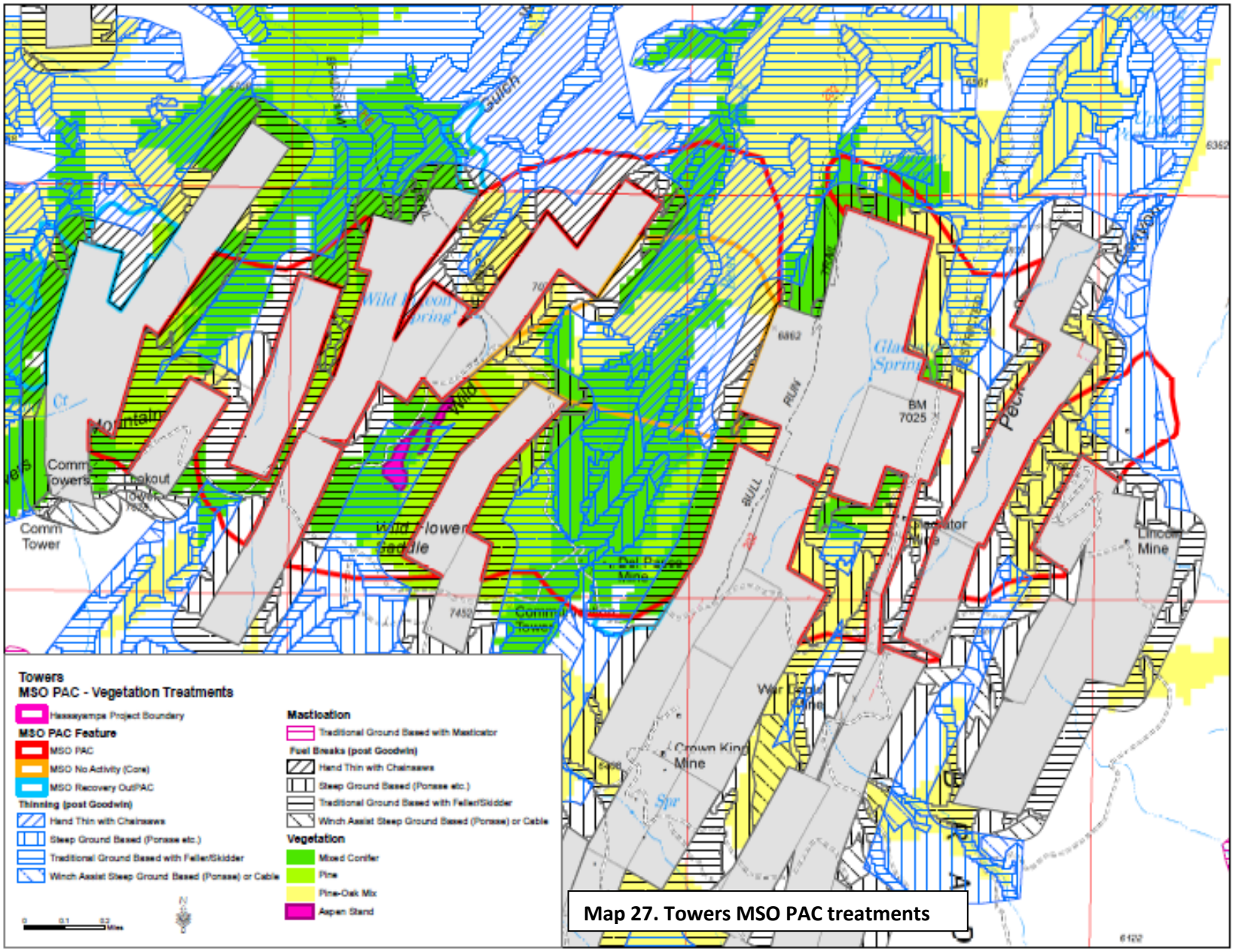
Map 24. Snowdrift MSO PAC treatments



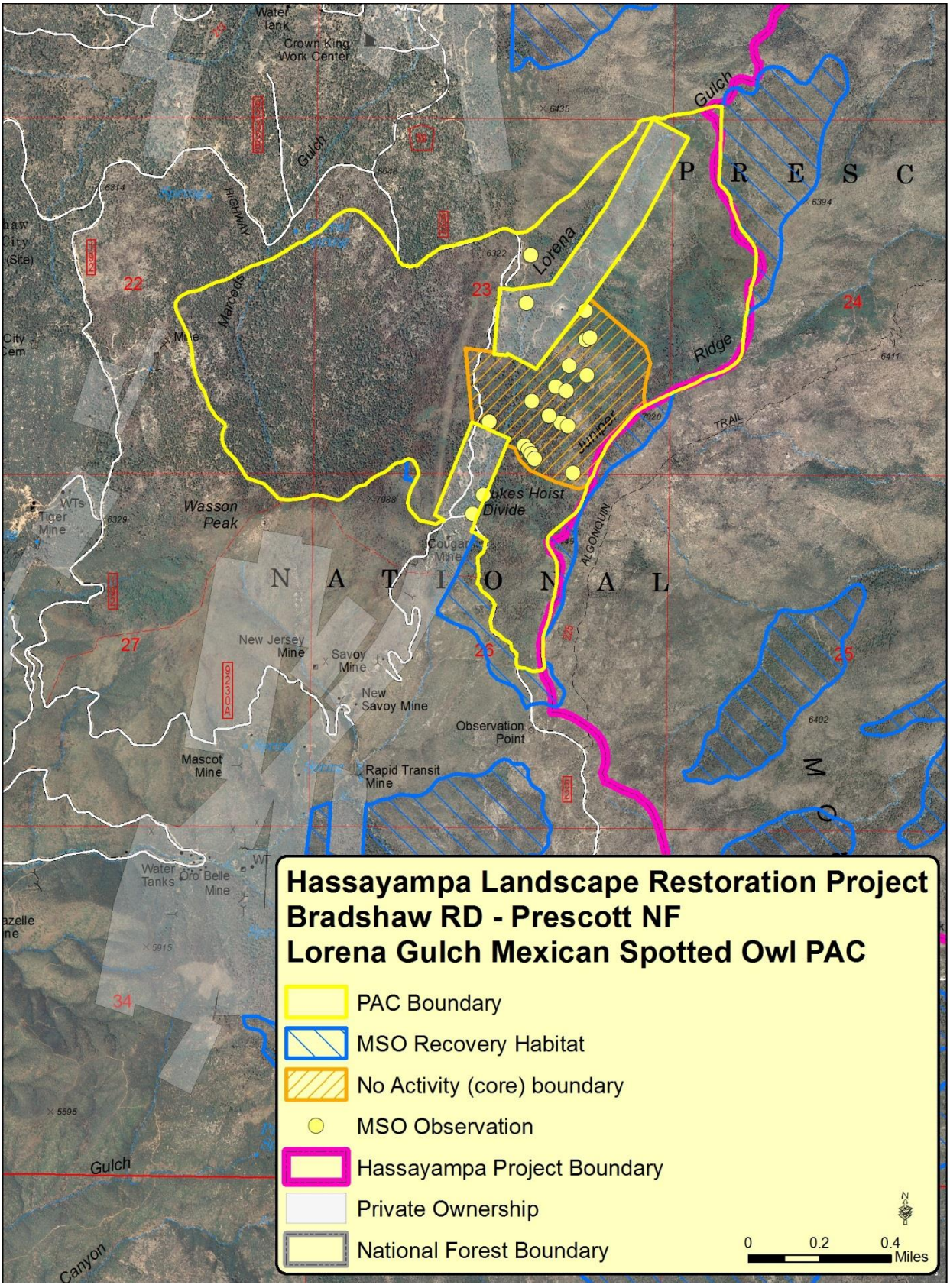
Map 25. Towers Mountain Mexican Spotted Owl PAC



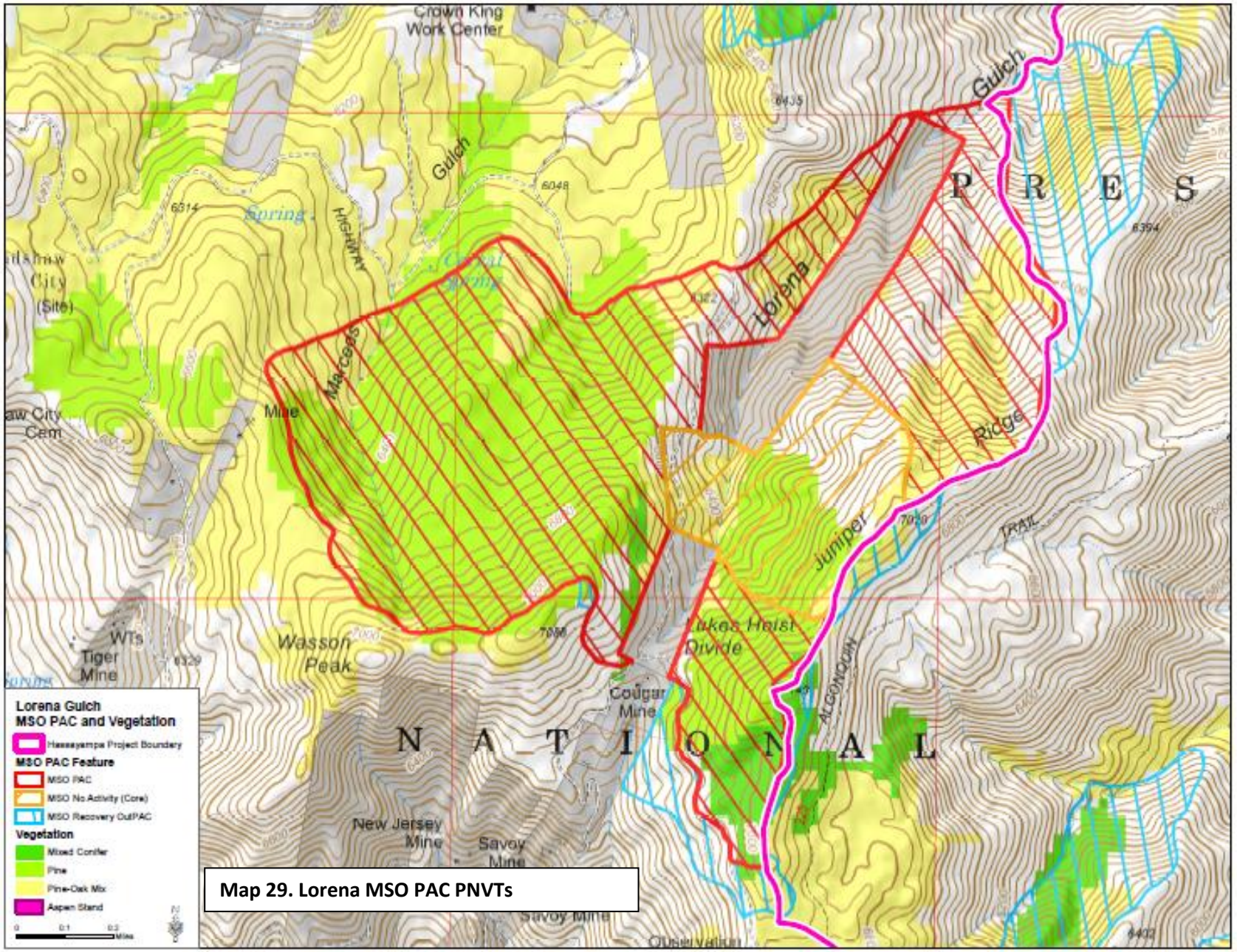
Map 26. Towers MSO PAC PNVTs



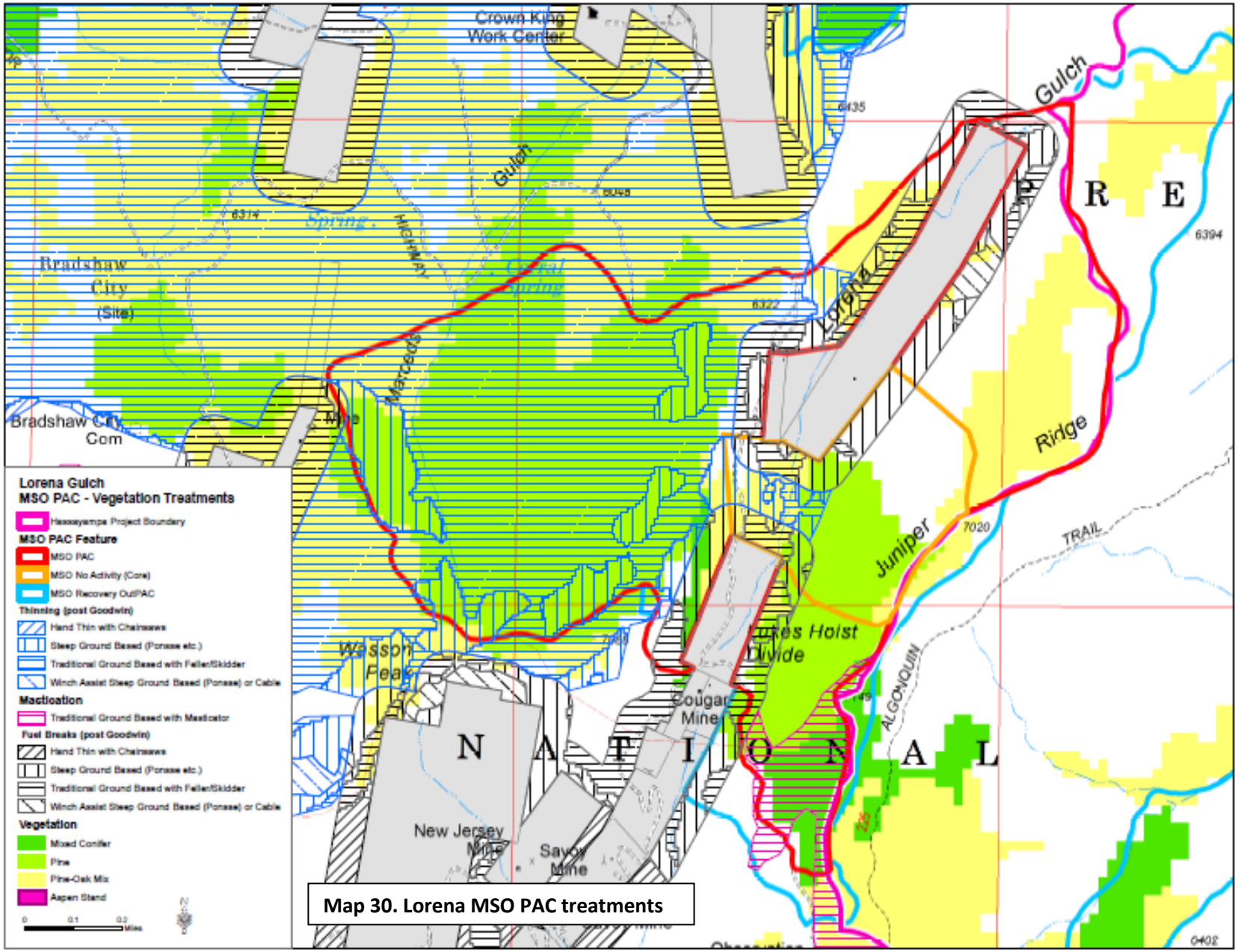
Map 27. Towers MSO PAC treatments



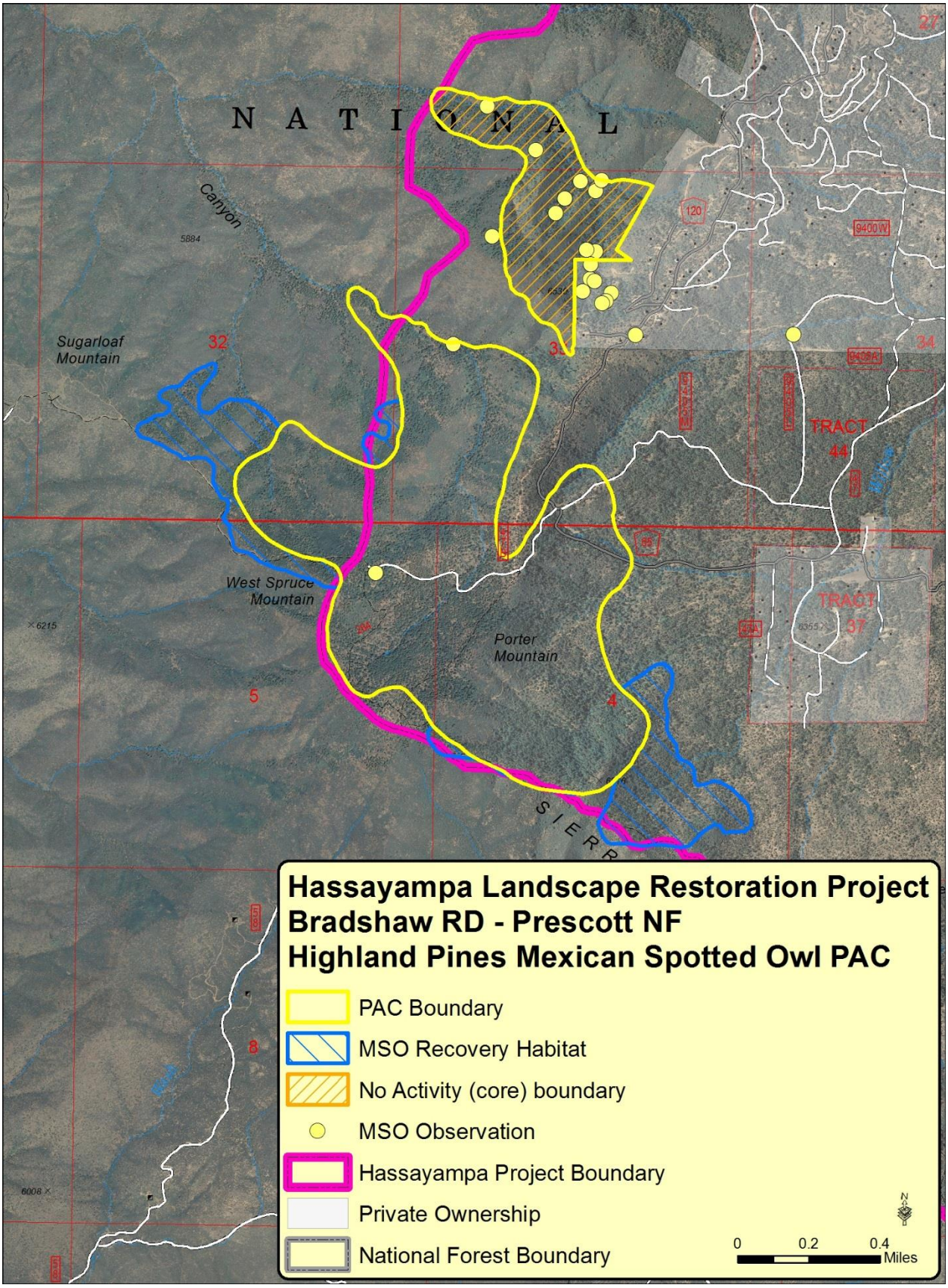
Map 28. Lorena Gulch Mexican Spotted Owl PAC



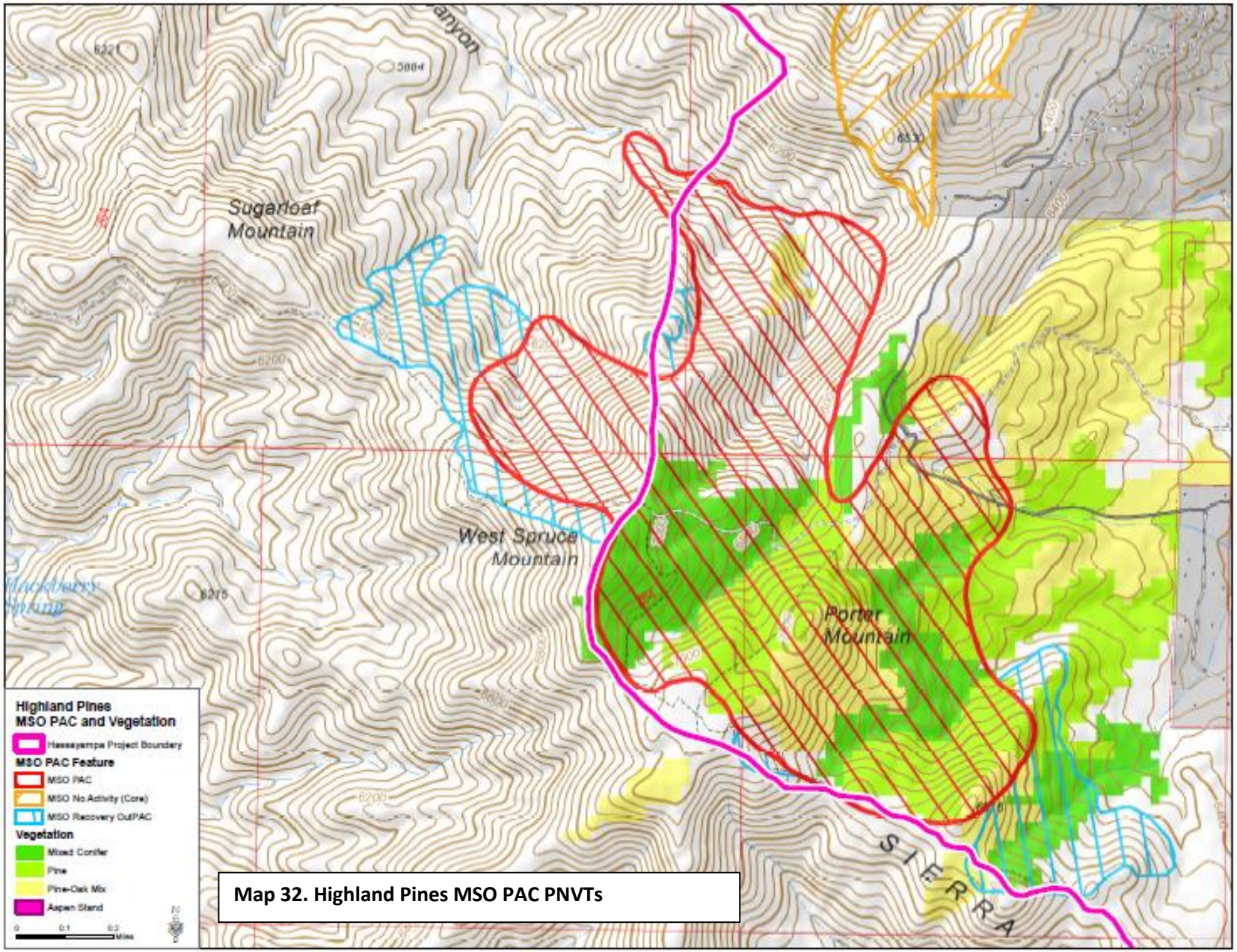
Map 29. Lorena MSO PAC PNVTs



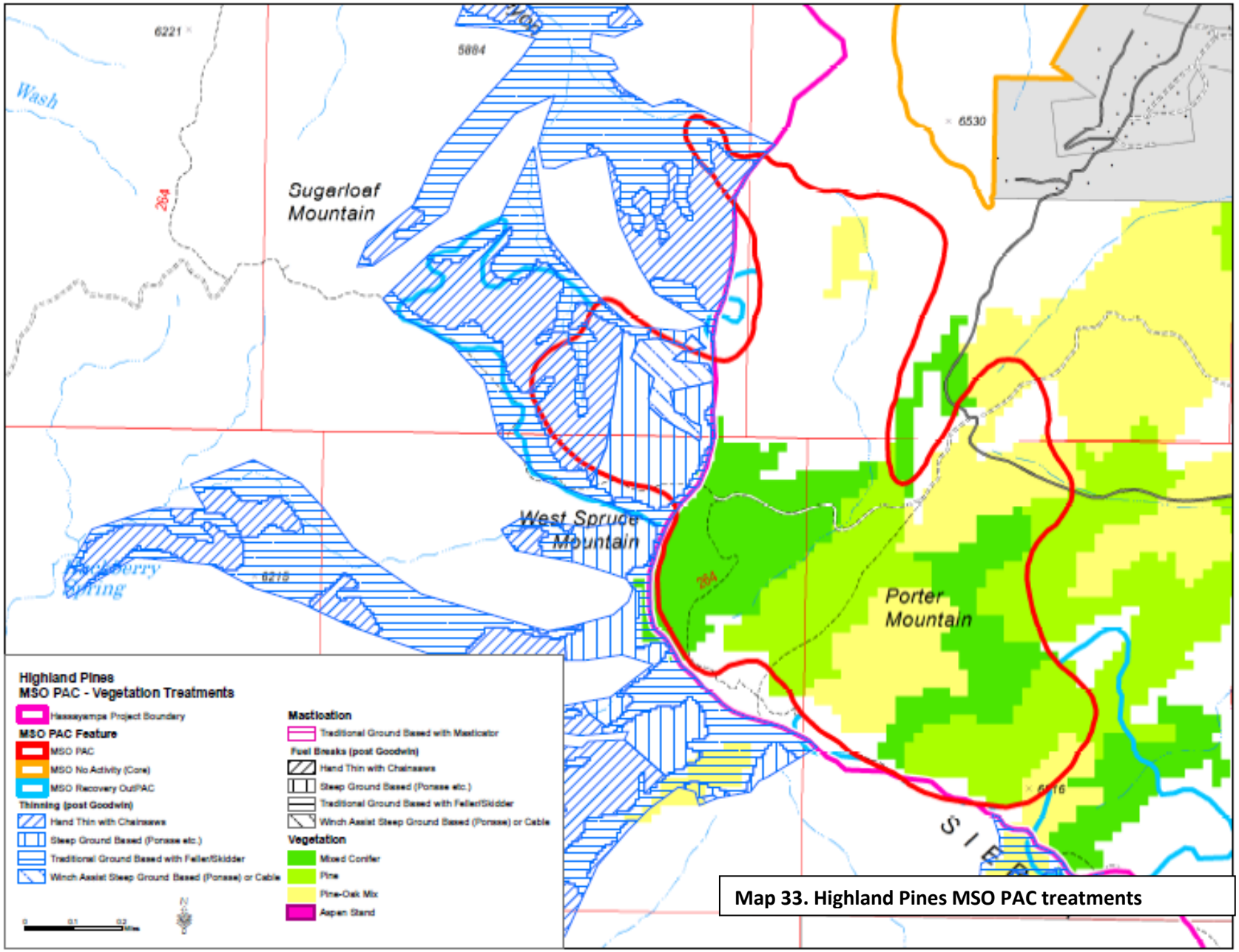
Map 30. Lorena MSO PAC treatments



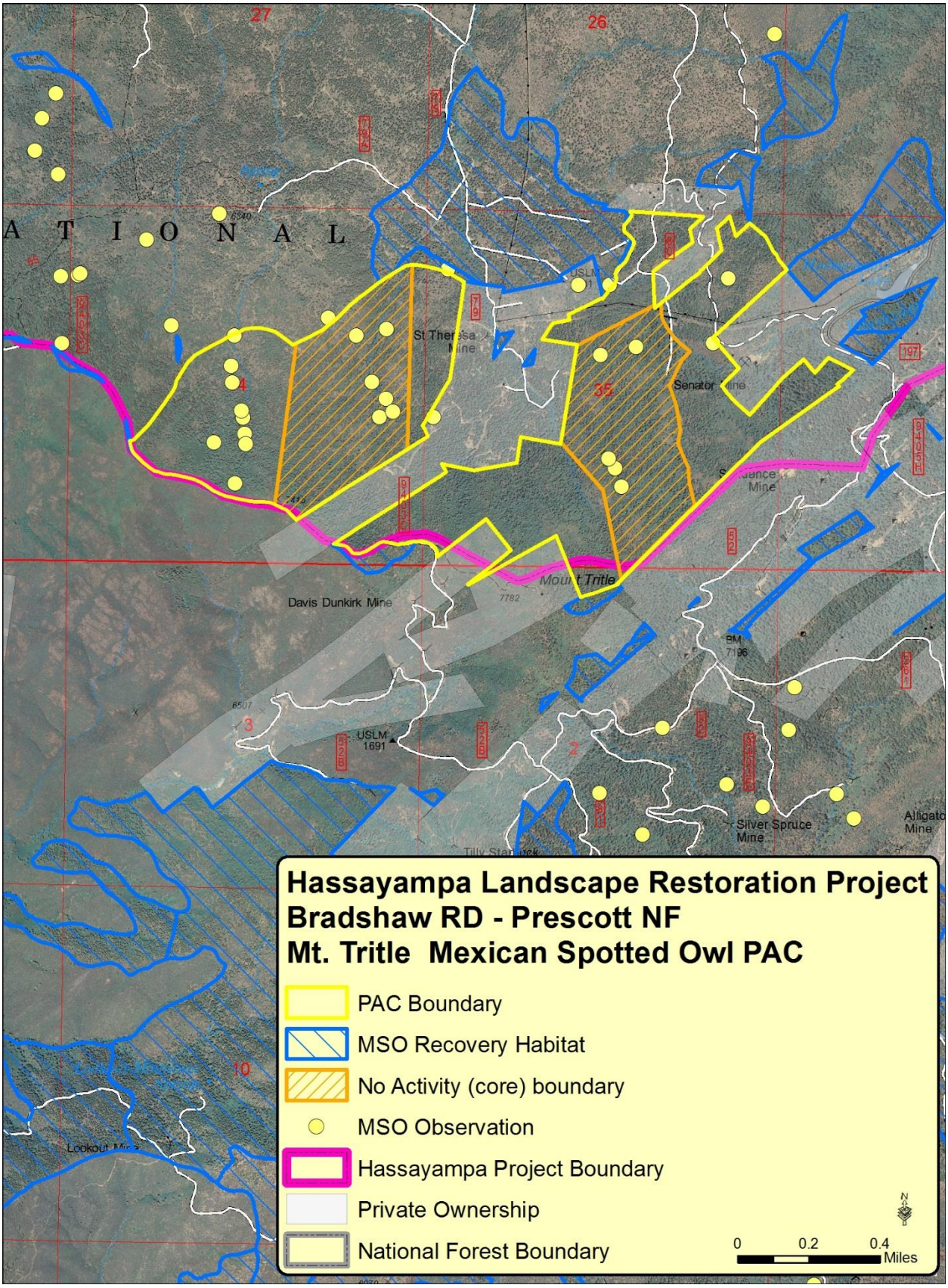
Map 31. Highland Pines Mexican Spotted Owl PAC



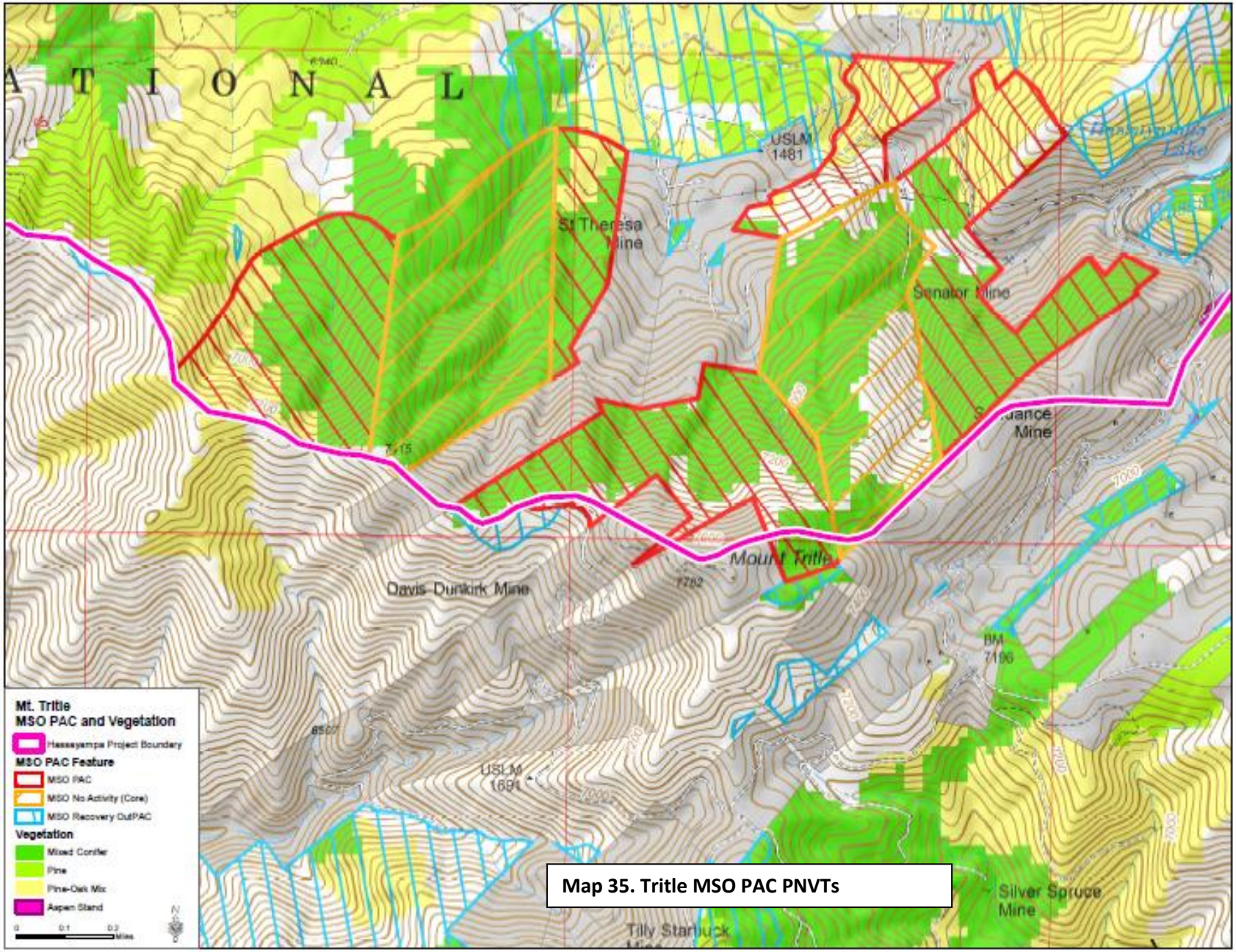
Map 32. Highland Pines MSO PAC PNVTs



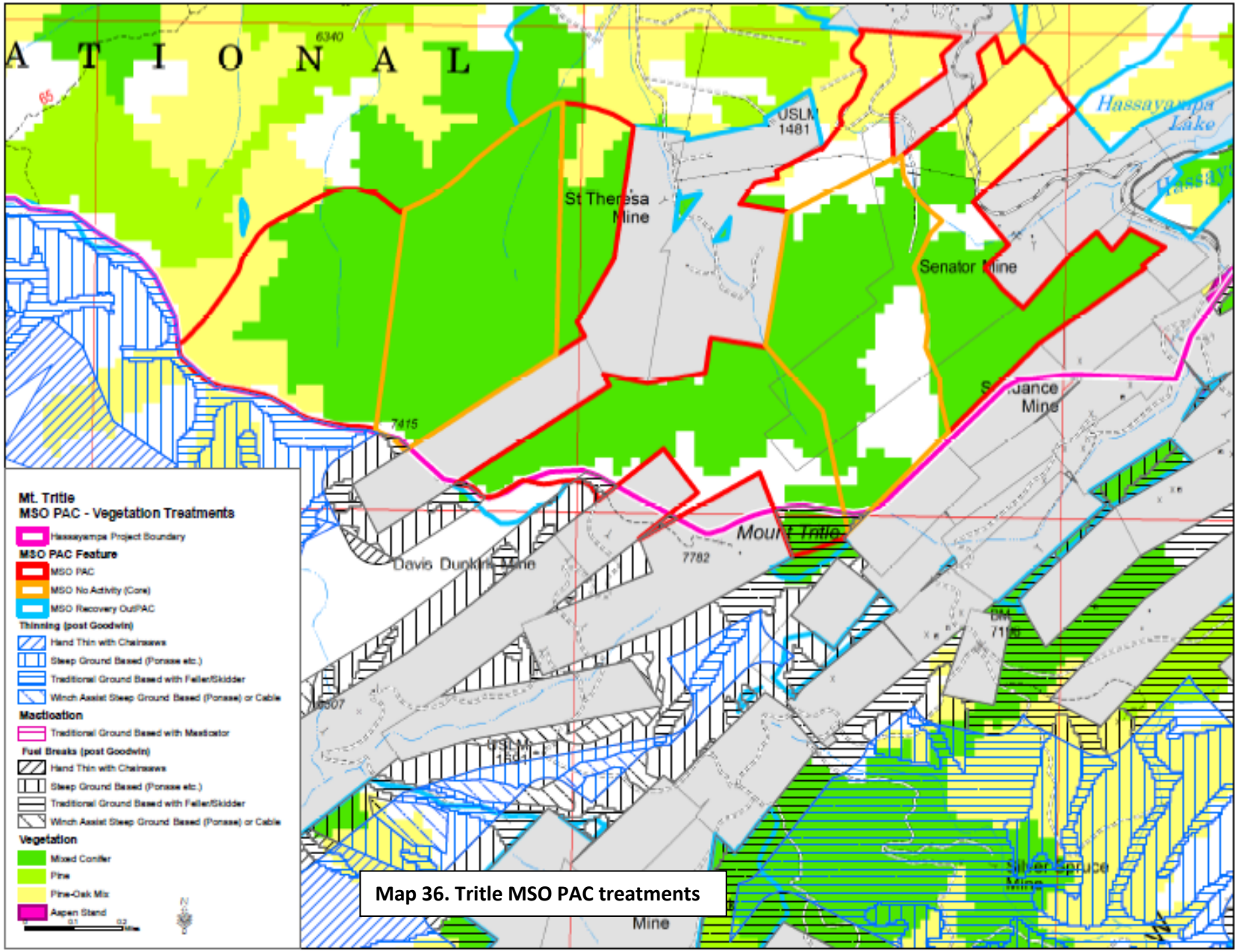
Map 33. Highland Pines MSO PAC treatments



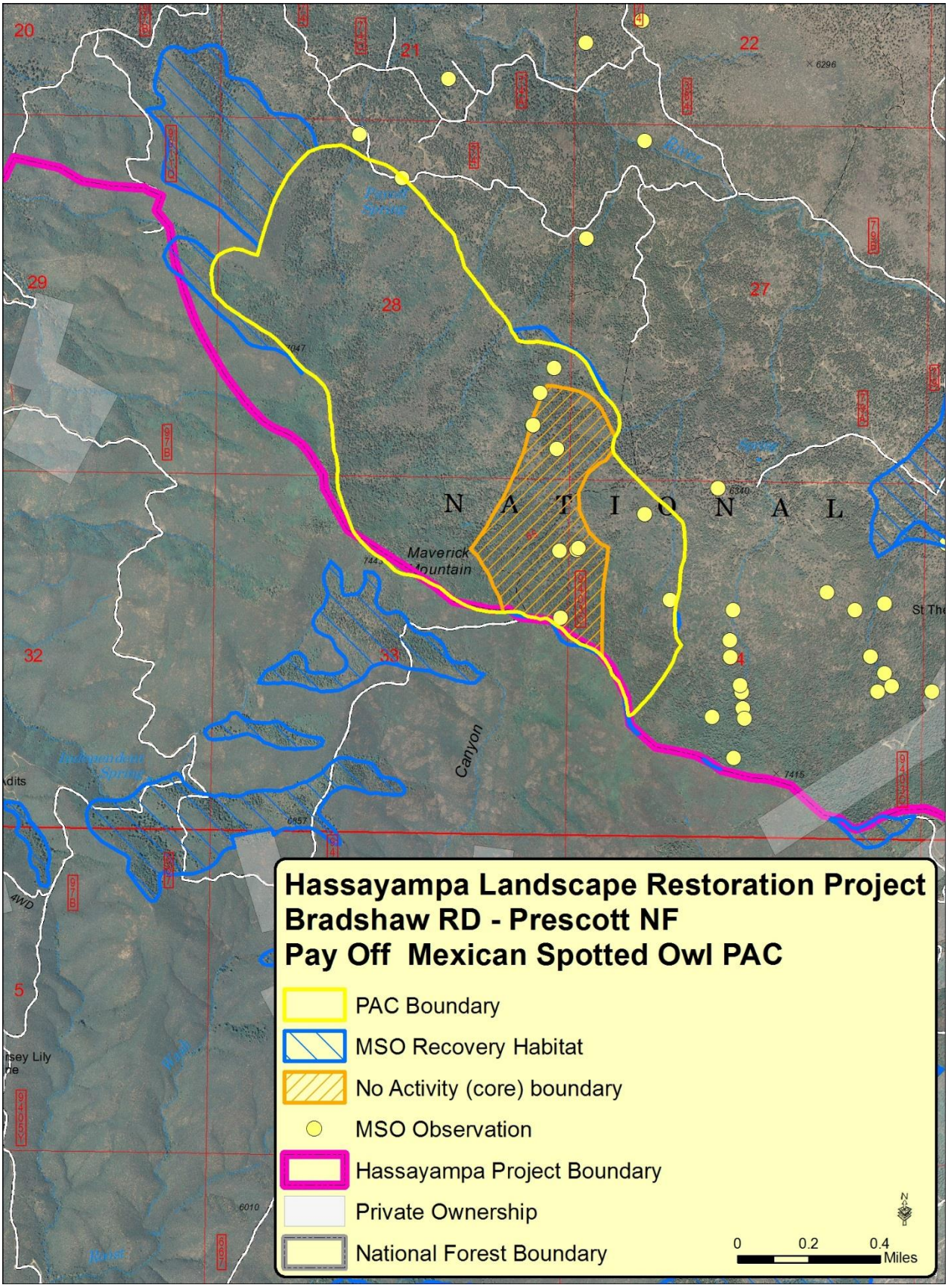
Map 34. Mt. Tritle Mexican Spotted Owl PAC



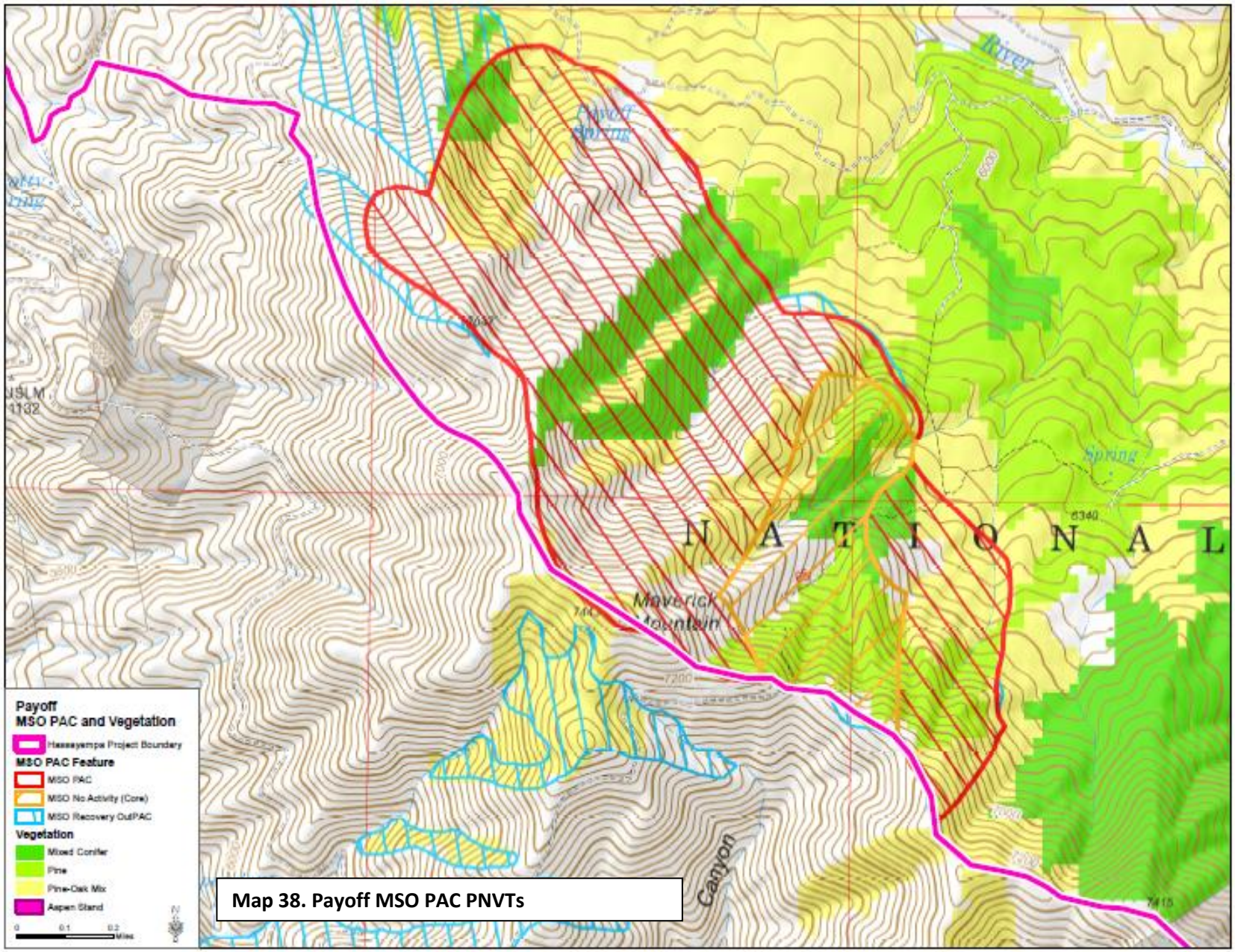
Map 35. Tritle MSO PAC PNVTs



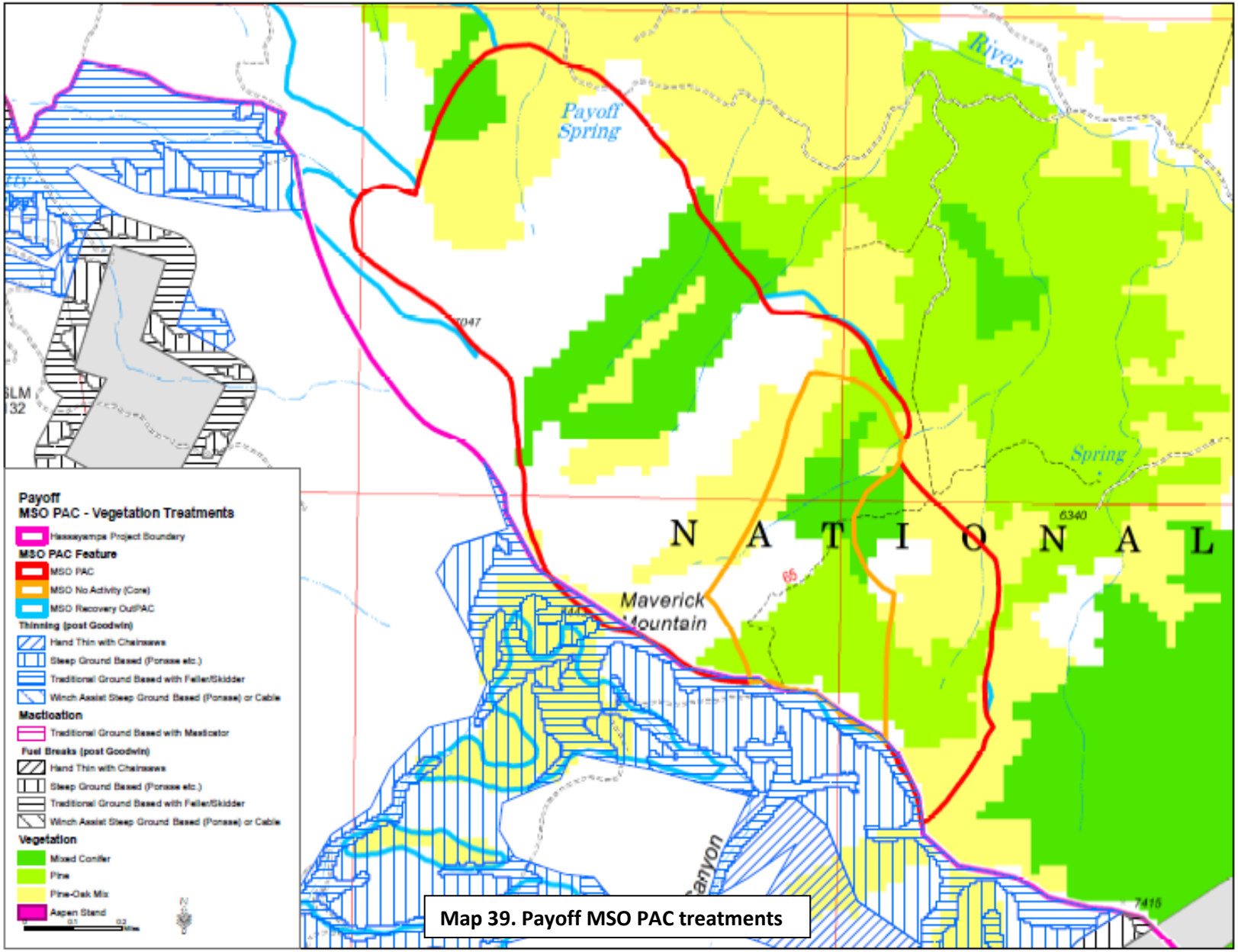
Map 36. Tritle MSO PAC treatments



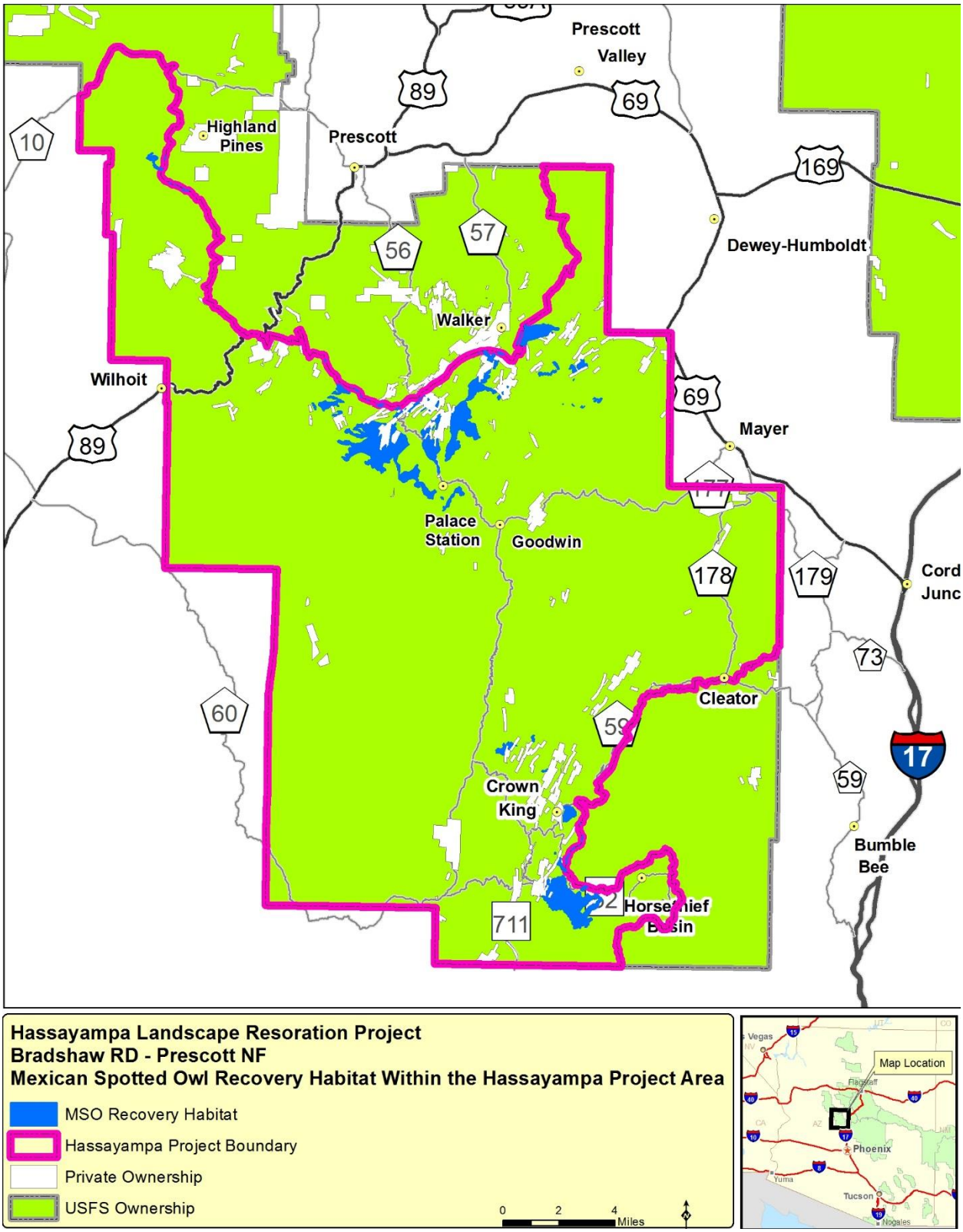
Map 37. Pay Off Mexican Spotted Owl PAC



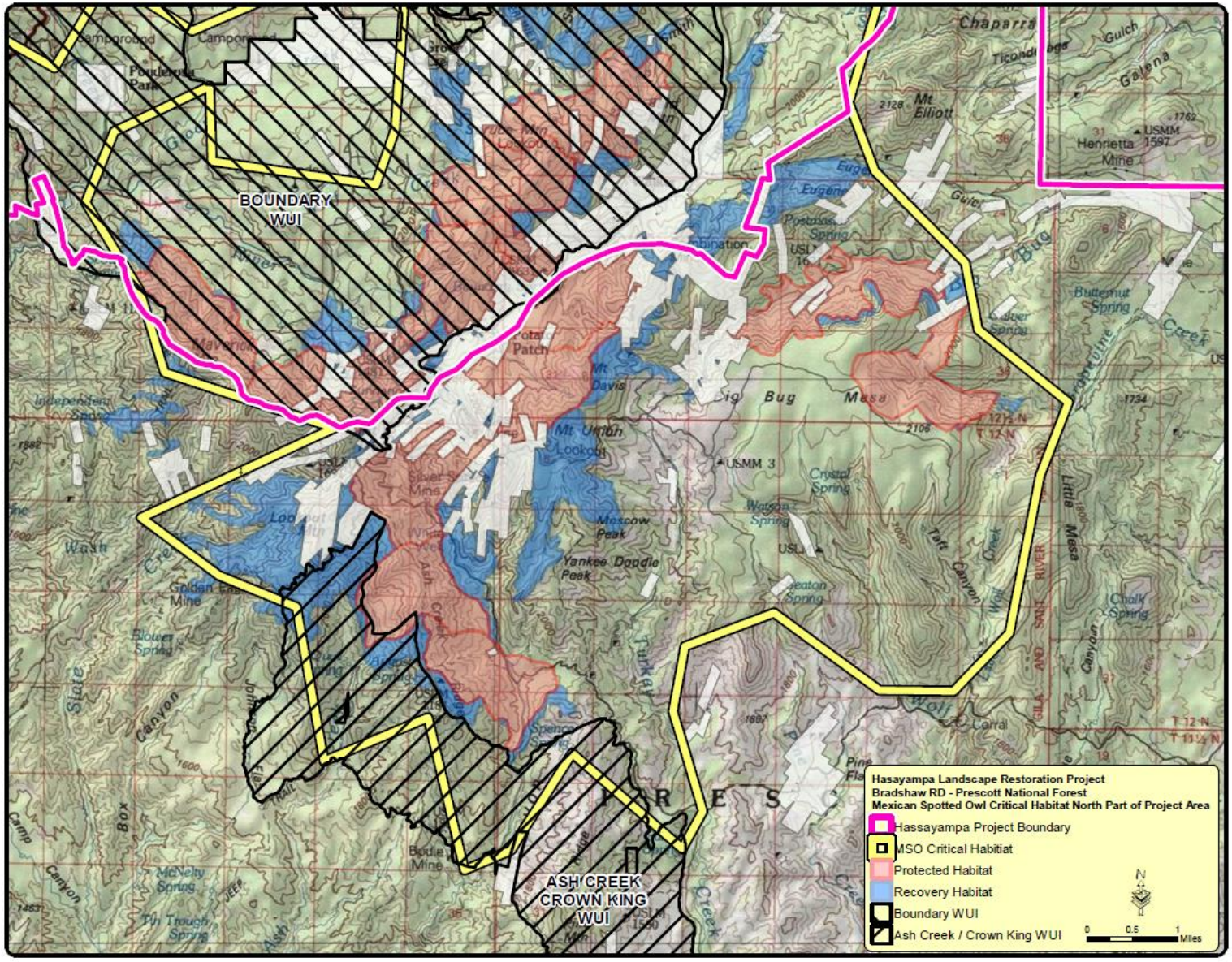
Map 38. Payoff MSO PAC PNVTs



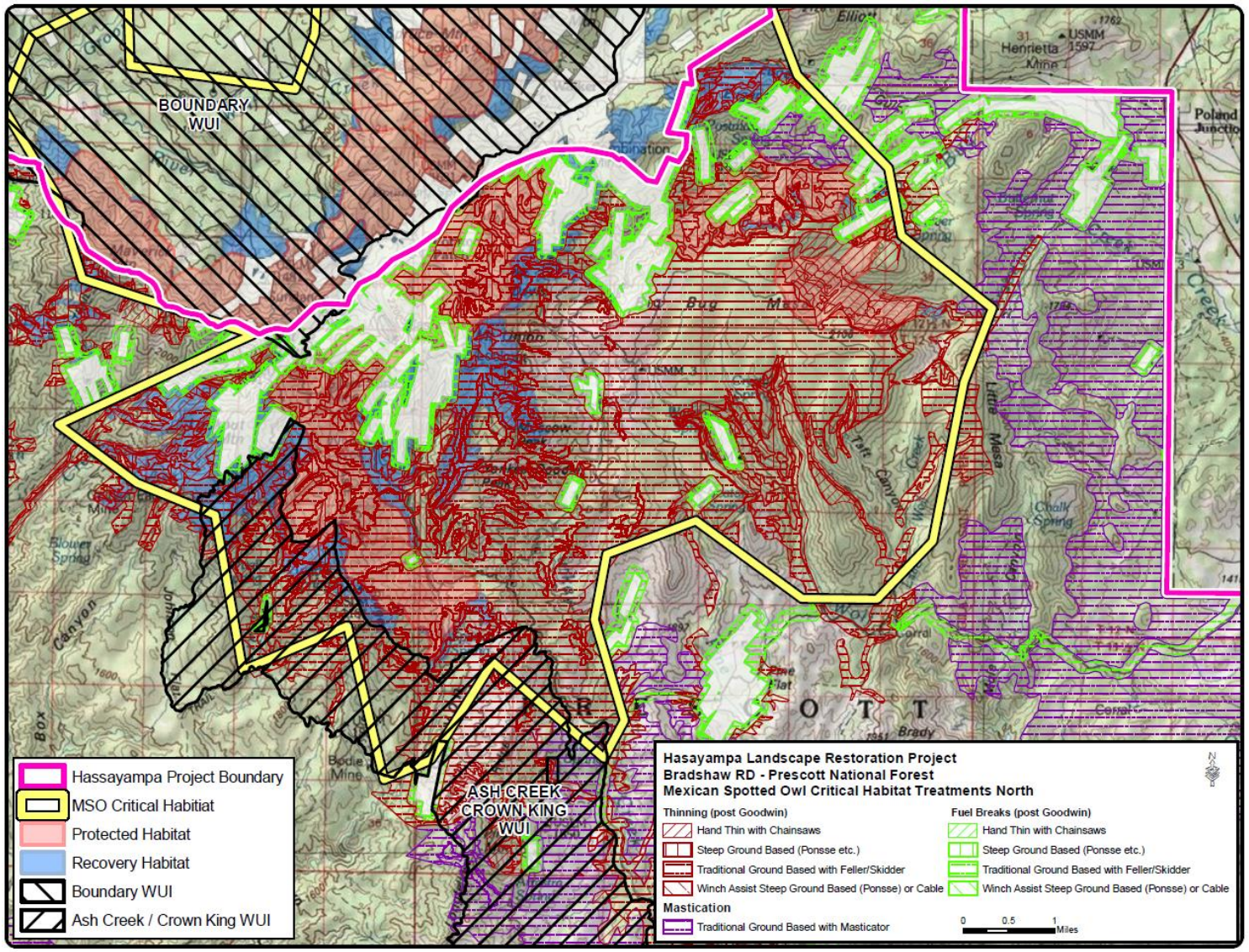
Map 39. Payoff MSO PAC treatments



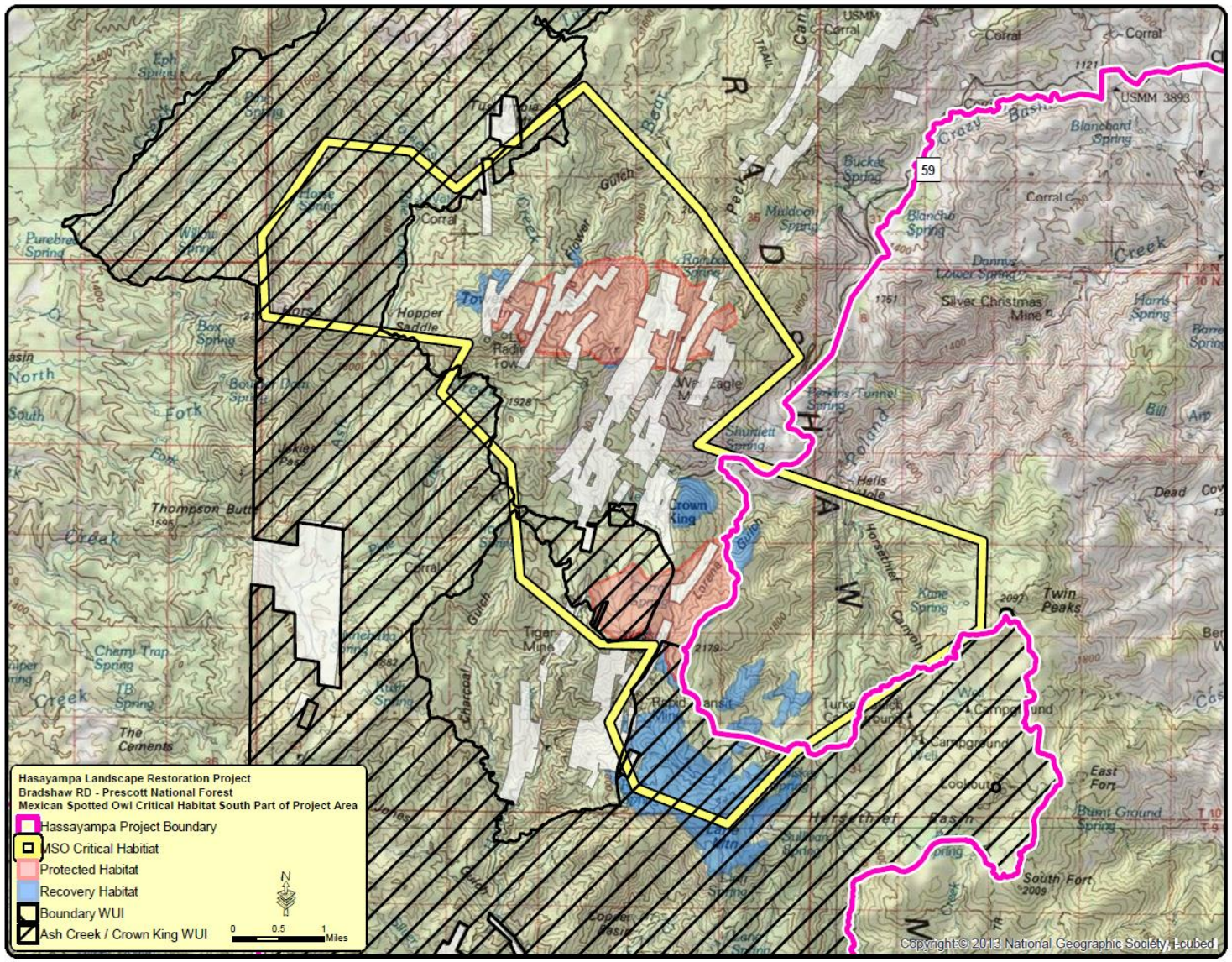
Map 40. Mexican spotted owl recovery habitat within the Hassayampa Project area



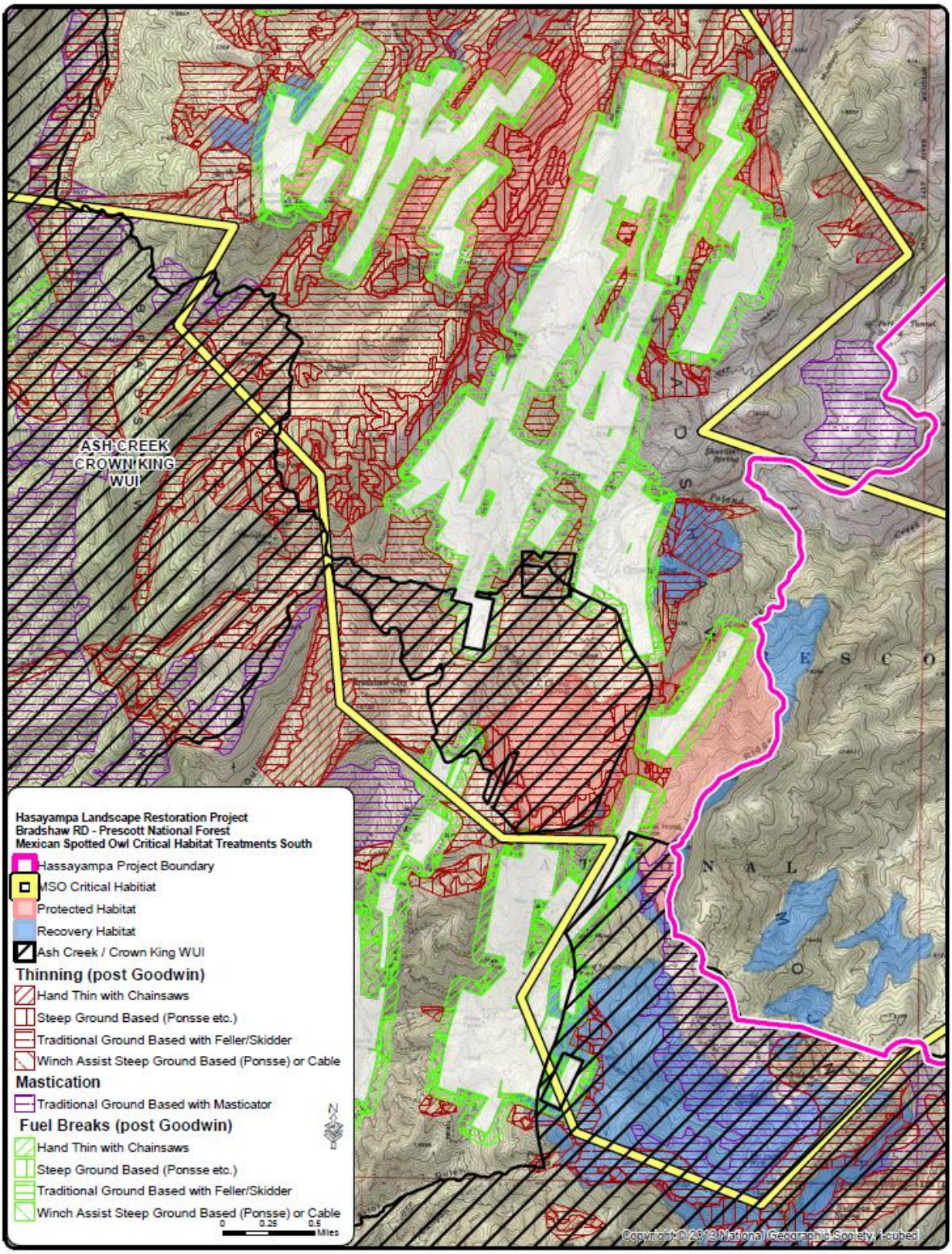
Map 41. MSO Critical Habitat in north portion of the project area



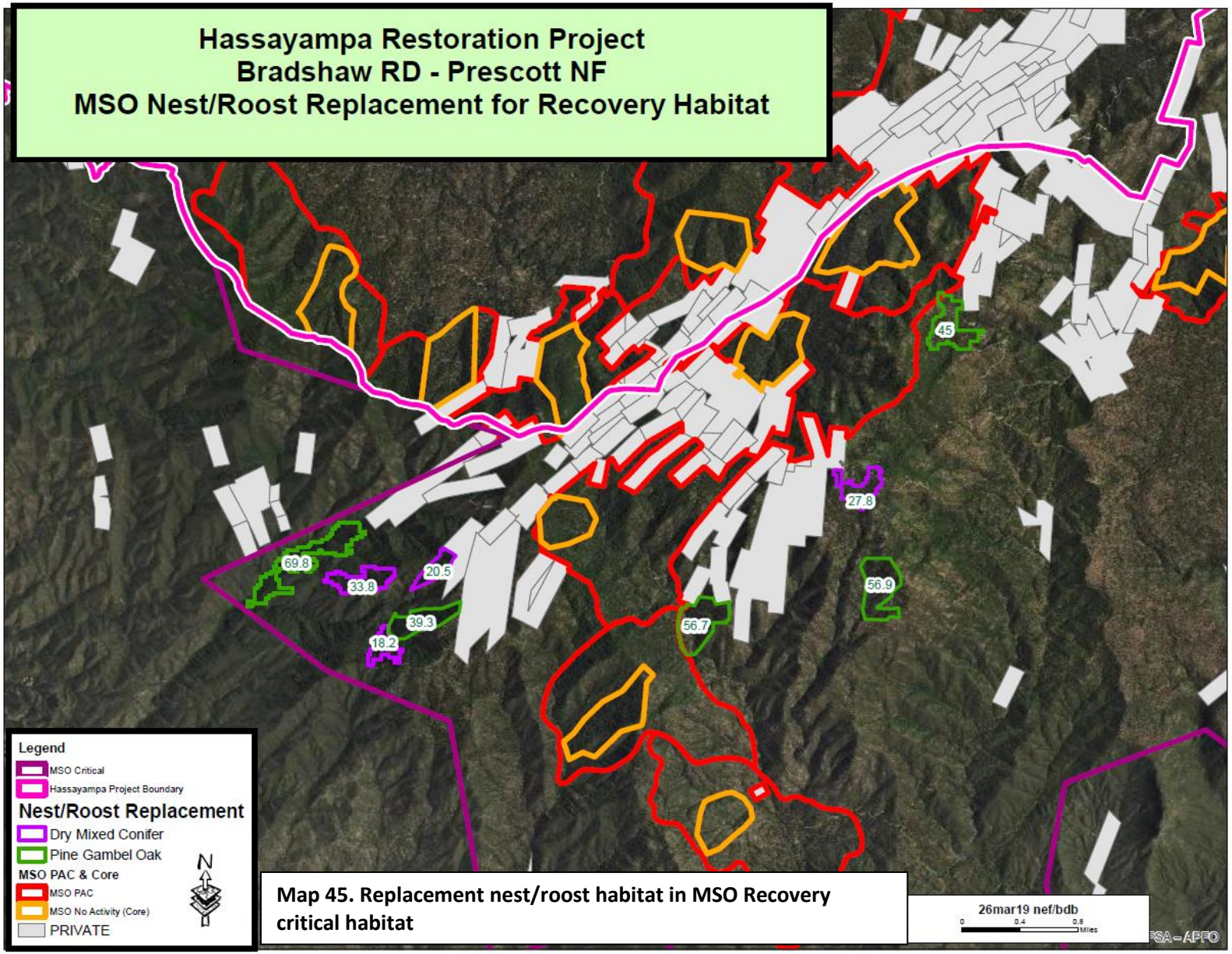
Map 42. Proposed treatments in MSO Critical Habitat in north portion of the project area



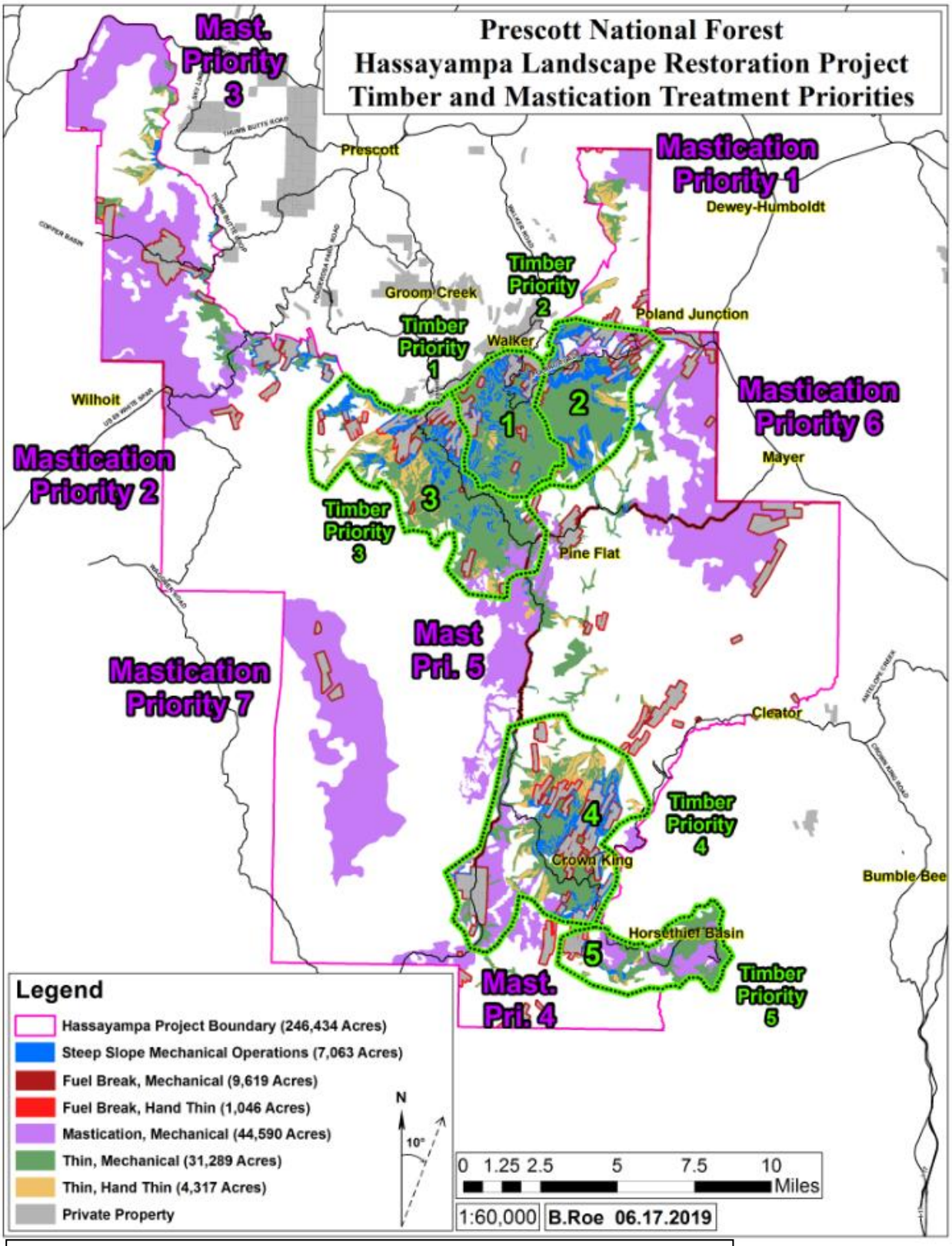
Map 43. MSO Critical Habitat in south portion of the project area



Map 44. Proposed treatments in MSO Critical Habitat in south portion of the project area



Map 45. Replacement nest/roost habitat in MSO Recovery critical habitat



Map 46. Forest Health Priorities for Implementing Hassayampa Project.

Appendix C: Tables

The following table hold all of the data used to produce the bar graphs for treatments by PNVT by tool within the MSO PACs, Cores, and Recovery Habitat.

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
Big Bug - MSO PAC	**Chaparral**	Fuel Break	Traditional Ground Based with Feller/Skidder	8.02
		Mastication	Traditional Ground Based with Feller/Skidder	1.75
		Thin	Steep Ground Based (Ponsse etc.)	16.09
			Traditional Ground Based with Feller/Skidder	43.79
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.53
	Juniper Woodland	Thin	Traditional Ground Based with Feller/Skidder	0.12
	Madrean Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.10
			Traditional Ground Based with Feller/Skidder	0.81
	Dry Mixed Conifer	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.21
			Traditional Ground Based with Feller/Skidder	1.76
		Thin	Steep Ground Based (Ponsse etc.)	9.33
			Traditional Ground Based with Feller/Skidder	9.71
			Winch Assist Steep Ground Based (Ponsse) or Cable	7.03
	Oak Woodland	Fuel Break	Hand Thin with Chainsaws	0.21
			Steep Ground Based (Ponsse etc.) or Cable Harvest	9.43
			Traditional Ground Based with Feller/Skidder	27.84
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.14
		Mastication	Traditional Ground Based with Feller/Skidder	0.19
		Thin	Hand Thin with Chainsaws	4.02
			Steep Ground Based (Ponsse etc.)	70.28
			Traditional Ground Based with Feller/Skidder	39.41
			Winch Assist Steep Ground Based (Ponsse) or Cable	47.69
	Pine	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	19.74

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Traditional Ground Based with Feller/Skidder	34.96
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.20
		Thin	Steep Ground Based (Ponsse etc.)	52.66
			Traditional Ground Based with Feller/Skidder	67.86
			Winch Assist Steep Ground Based (Ponsse) or Cable	14.31
	Pine-Oak Mix	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	1.91
			Traditional Ground Based with Feller/Skidder	11.61
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.83
		Thin	Steep Ground Based (Ponsse etc.)	50.54
			Traditional Ground Based with Feller/Skidder	4.79
			Winch Assist Steep Ground Based (Ponsse) or Cable	20.61
Big Bug - MSO Core	**Madrean Woodland**	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.12
			Traditional Ground Based with Feller/Skidder	0.44
		Thin	Steep Ground Based (Ponsse etc.)	0.05
			Traditional Ground Based with Feller/Skidder	1.47
	Oak Woodland	Fuel Break	Traditional Ground Based with Feller/Skidder	1.75
		Thin	Traditional Ground Based with Feller/Skidder	19.44
	Pine	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	5.67
			Traditional Ground Based with Feller/Skidder	4.29
		Thin	Steep Ground Based (Ponsse etc.)	22.89
			Traditional Ground Based with Feller/Skidder	26.65
			Winch Assist Steep Ground Based (Ponsse) or Cable	1.62
	Pine-Oak Mix	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	2.22
			Traditional Ground Based with Feller/Skidder	0.23
		Thin	Steep Ground Based (Ponsse etc.)	10.55
			Traditional Ground Based with Feller/Skidder	2.88

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
Grapevine - MSO PAC	**Chaparral**	Thin	Hand Thin with Chainsaws	22.43
			Traditional Ground Based with Feller/Skidder	0.00
		(blank)	(blank)	6.37
	Juniper Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.00
			Winch Assist Steep Ground Based (Ponsse) or Cable	1.19
		Thin	Hand Thin with Chainsaws	2.06
			Steep Ground Based (Ponsse etc.)	0.40
			Traditional Ground Based with Feller/Skidder	6.02
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.37
		(blank)	(blank)	0.04
	Dry Mixed Conifer	Thin	Hand Thin with Chainsaws	6.53
	Oak Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	4.93
			Traditional Ground Based with Feller/Skidder	1.52
			Winch Assist Steep Ground Based (Ponsse) or Cable	6.14
		Thin	Hand Thin with Chainsaws	137.29
			Steep Ground Based (Ponsse etc.)	7.44
			Traditional Ground Based with Feller/Skidder	5.07
			Winch Assist Steep Ground Based (Ponsse) or Cable	8.66
		(blank)	(blank)	0.32
	Pine	Thin	Hand Thin with Chainsaws	71.42
			Steep Ground Based (Ponsse etc.)	2.37
			Traditional Ground Based with Feller/Skidder	68.56
	Pine-Oak Mix	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.30
			Traditional Ground Based with Feller/Skidder	0.07
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.40
		Thin	Hand Thin with Chainsaws	119.28
			Steep Ground Based (Ponsse etc.)	7.45
			Traditional Ground Based with Feller/Skidder	9.70

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.17
		(blank)	(blank)	0.27
	Pinyon Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.95
			Traditional Ground Based with Feller/Skidder	0.17
			Winch Assist Steep Ground Based (Ponsse) or Cable	1.57
		Thin	Steep Ground Based (Ponsse etc.)	0.39
Grapevine - MSO Core	**Chaparral**	Thin	Hand Thin with Chainsaws	5.44
		(blank)	(blank)	0.22
	Dry Mixed Conifer	Thin	Hand Thin with Chainsaws	8.59
	Oak Woodland	Thin	Hand Thin with Chainsaws	11.07
			Traditional Ground Based with Feller/Skidder	0.01
	Pine	Thin	Hand Thin with Chainsaws	21.47
			Traditional Ground Based with Feller/Skidder	0.39
	Pine-Oak Mix	Thin	Hand Thin with Chainsaws	52.90
		(blank)	(blank)	0.14
Highland Pines - MSO PAC	**Chaparral**	Thin	Hand Thin with Chainsaws	2.39
			Steep Ground Based (Ponsse etc.)	7.09
			Traditional Ground Based with Feller/Skidder	0.44
			Winch Assist Steep Ground Based (Ponsse) or Cable	3.30
		(blank)	(blank)	1.14
	Juniper Woodland	Thin	Hand Thin with Chainsaws	0.27
			Steep Ground Based (Ponsse etc.)	0.11
			Traditional Ground Based with Feller/Skidder	1.08
		(blank)	(blank)	1.02
	Dry Mixed Conifer	Thin	Steep Ground Based (Ponsse etc.)	0.00
			Traditional Ground Based with Feller/Skidder	0.09
		(blank)	(blank)	0.01
	Oak Woodland	Thin	Hand Thin with Chainsaws	22.13
			Steep Ground Based (Ponsse etc.)	20.76

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Traditional Ground Based with Feller/Skidder	6.92
			Winch Assist Steep Ground Based (Ponsse) or Cable	6.64
		(blank)	(blank)	0.02
	Pinyon Woodland	Thin	Traditional Ground Based with Feller/Skidder	1.28
	(blank)	Thin	Hand Thin with Chainsaws	0.03
			Steep Ground Based (Ponsse etc.)	0.27
			Traditional Ground Based with Feller/Skidder	0.66
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.02
		(blank)	(blank)	0.46
Highland Pines - MSO Core	**Chaparral**	Thin	Hand Thin with Chainsaws	0.01
			Traditional Ground Based with Feller/Skidder	0.02
	Oak Woodland	Thin	Hand Thin with Chainsaws	0.03
			Traditional Ground Based with Feller/Skidder	0.19
Lorena Gulch - MSO PAC	**Chaparral**	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	1.07
			Traditional Ground Based with Feller/Skidder	0.88
		Mastication	Traditional Ground Based with Feller/Skidder	2.76
		Thin	Steep Ground Based (Ponsse etc.)	2.40
			Traditional Ground Based with Feller/Skidder	0.18
		(blank)	(blank)	3.06
	Dry Mixed Conifer	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	4.10
			Traditional Ground Based with Feller/Skidder	0.48
		Mastication	Traditional Ground Based with Feller/Skidder	14.03
		Thin	Steep Ground Based (Ponsse etc.)	0.51
			Traditional Ground Based with Feller/Skidder	0.74
		(blank)	(blank)	2.76
	Oak Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	26.29
			Traditional Ground Based with Feller/Skidder	18.74

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Winch Assist Steep Ground Based (Ponsse) or Cable	3.69
		Thin	Steep Ground Based (Ponsse etc.)	5.21
			Traditional Ground Based with Feller/Skidder	6.02
		(blank)	(blank)	50.76
	Pine	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	3.50
			Traditional Ground Based with Feller/Skidder	4.32
		Mastication	Traditional Ground Based with Feller/Skidder	6.66
		Thin	Steep Ground Based (Ponsse etc.)	52.21
			Traditional Ground Based with Feller/Skidder	200.93
		(blank)	(blank)	25.51
	Pine-Oak Mix	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	10.45
			Traditional Ground Based with Feller/Skidder	10.67
			Winch Assist Steep Ground Based (Ponsse) or Cable	1.41
		Mastication	Traditional Ground Based with Feller/Skidder	0.01
		Thin	Steep Ground Based (Ponsse etc.)	8.24
			Traditional Ground Based with Feller/Skidder	42.54
		(blank)	(blank)	56.77
	PJ Woodland	Mastication	Traditional Ground Based with Feller/Skidder	3.43
		(blank)	(blank)	0.04
	(blank)	(blank)	(blank)	0.06
Lorena Gulch - MSO Core	**Oak Woodland**	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	10.15
			Traditional Ground Based with Feller/Skidder	2.21
		Thin	Steep Ground Based (Ponsse etc.)	1.48
			Traditional Ground Based with Feller/Skidder	0.07
		(blank)	(blank)	26.67
	Pine	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	5.79
			Traditional Ground Based with Feller/Skidder	0.76
		Thin	Steep Ground Based (Ponsse etc.)	1.62

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Traditional Ground Based with Feller/Skidder	1.02
		(blank)	(blank)	30.98
	Pine-Oak Mix	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	2.82
			Traditional Ground Based with Feller/Skidder	5.03
		Thin	Steep Ground Based (Ponsse etc.)	5.09
			Traditional Ground Based with Feller/Skidder	2.58
		(blank)	(blank)	5.16
MSO Recovery	**Chaparral**	Fuel Break	Hand Thin with Chainsaws	2.23
			Steep Ground Based (Ponsse etc.) or Cable Harvest	21.36
			Traditional Ground Based with Feller/Skidder	34.93
			Winch Assist Steep Ground Based (Ponsse) or Cable	6.83
		Mastication	Traditional Ground Based with Feller/Skidder	5.22
		Thin	Hand Thin with Chainsaws	43.93
			Steep Ground Based (Ponsse etc.)	66.05
			Traditional Ground Based with Feller/Skidder	133.53
			Winch Assist Steep Ground Based (Ponsse) or Cable	2.13
		(blank)	(blank)	54.20
	Juniper Woodland	Fuel Break	Traditional Ground Based with Feller/Skidder	1.42
		Thin	Hand Thin with Chainsaws	5.91
			Steep Ground Based (Ponsse etc.)	0.14
			Traditional Ground Based with Feller/Skidder	18.83
		(blank)	(blank)	3.25
	Madrean Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	1.49
			Traditional Ground Based with Feller/Skidder	4.06
		Thin	Hand Thin with Chainsaws	1.68
			Steep Ground Based (Ponsse etc.)	30.42
			Traditional Ground Based with Feller/Skidder	32.21
	Dry Mixed Conifer	Fuel Break	Hand Thin with Chainsaws	16.97
			Steep Ground Based (Ponsse etc.) or Cable Harvest	41.60

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Traditional Ground Based with Feller/Skidder	103.36
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.00
		Mastication	Traditional Ground Based with Feller/Skidder	3.41
		Thin	Hand Thin with Chainsaws	51.30
			Steep Ground Based (Ponsse etc.)	80.78
			Traditional Ground Based with Feller/Skidder	136.23
			Winch Assist Steep Ground Based (Ponsse) or Cable	5.30
		(blank)	(blank)	106.38
	Oak Woodland	Fuel Break	Hand Thin with Chainsaws	20.67
			Steep Ground Based (Ponsse etc.) or Cable Harvest	48.65
			Traditional Ground Based with Feller/Skidder	47.90
			Winch Assist Steep Ground Based (Ponsse) or Cable	6.18
		Mastication	Traditional Ground Based with Feller/Skidder	2.98
		Thin	Hand Thin with Chainsaws	201.93
			Steep Ground Based (Ponsse etc.)	250.80
			Traditional Ground Based with Feller/Skidder	498.36
			Winch Assist Steep Ground Based (Ponsse) or Cable	58.13
		(blank)	(blank)	86.37
	Pine	Fuel Break	Hand Thin with Chainsaws	1.78
			Steep Ground Based (Ponsse etc.) or Cable Harvest	3.92
			Traditional Ground Based with Feller/Skidder	14.66
		Mastication	Traditional Ground Based with Feller/Skidder	169.00
		Thin	Hand Thin with Chainsaws	3.59
			Steep Ground Based (Ponsse etc.)	16.70
			Traditional Ground Based with Feller/Skidder	126.51
			Winch Assist Steep Ground Based (Ponsse) or Cable	3.16
		(blank)	(blank)	97.58
	Pine-Oak Mix	Fuel Break	Hand Thin with Chainsaws	36.69

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Steep Ground Based (Ponsse etc.) or Cable Harvest	71.88
			Traditional Ground Based with Feller/Skidder	138.35
			Winch Assist Steep Ground Based (Ponsse) or Cable	5.00
		Mastication	Traditional Ground Based with Feller/Skidder	89.05
		Thin	Hand Thin with Chainsaws	345.10
			Steep Ground Based (Ponsse etc.)	358.28
			Traditional Ground Based with Feller/Skidder	768.33
			Winch Assist Steep Ground Based (Ponsse) or Cable	36.47
		(blank)	(blank)	187.80
	Pinyon Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	3.83
			Traditional Ground Based with Feller/Skidder	2.89
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.43
		Thin	Hand Thin with Chainsaws	4.43
			Steep Ground Based (Ponsse etc.)	0.85
			Traditional Ground Based with Feller/Skidder	0.49
		(blank)	(blank)	2.15
	PJ Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.45
			Traditional Ground Based with Feller/Skidder	3.16
		Mastication	Traditional Ground Based with Feller/Skidder	1.30
		Thin	Hand Thin with Chainsaws	0.10
			Steep Ground Based (Ponsse etc.)	0.17
			Traditional Ground Based with Feller/Skidder	13.20
		(blank)	(blank)	0.06
	(blank)	Fuel Break	Hand Thin with Chainsaws	0.00
			Traditional Ground Based with Feller/Skidder	0.00
		Thin	Hand Thin with Chainsaws	0.08
			Steep Ground Based (Ponsse etc.)	0.05
			Traditional Ground Based with Feller/Skidder	0.77
		(blank)	(blank)	0.40

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
Mt. Pine Acres - MSO PAC	**Dry Mixed Conifer**	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	27.51
			Traditional Ground Based with Feller/Skidder	50.51
		Thin	Steep Ground Based (Ponsse etc.)	15.87
			Traditional Ground Based with Feller/Skidder	62.79
	Oak Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	3.66
			Traditional Ground Based with Feller/Skidder	3.17
		Thin	Steep Ground Based (Ponsse etc.)	16.87
			Traditional Ground Based with Feller/Skidder	22.60
	Pine	Fuel Break	Traditional Ground Based with Feller/Skidder	25.45
		Thin	Steep Ground Based (Ponsse etc.)	2.32
			Traditional Ground Based with Feller/Skidder	44.55
	Pine-Oak Mix	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	8.16
			Traditional Ground Based with Feller/Skidder	11.63
		Thin	Steep Ground Based (Ponsse etc.)	107.78
			Traditional Ground Based with Feller/Skidder	111.51
Mt. Pine Acres - MSO Core	**Dry Mixed Conifer**	Fuel Break	Traditional Ground Based with Feller/Skidder	33.25
		Thin	Traditional Ground Based with Feller/Skidder	53.78
	Pine	Fuel Break	Traditional Ground Based with Feller/Skidder	8.49
		Thin	Traditional Ground Based with Feller/Skidder	5.40
Mt. Tritle - MSO PAC	**Dry Mixed Conifer**	Fuel Break	Hand Thin with Chainsaws	0.01
			Traditional Ground Based with Feller/Skidder	6.48
		(blank)	(blank)	0.24
	Oak Woodland	Fuel Break	Hand Thin with Chainsaws	0.00
			Steep Ground Based (Ponsse etc.) or Cable Harvest	0.46
			Traditional Ground Based with Feller/Skidder	1.41
		Thin	Traditional Ground Based with Feller/Skidder	0.03

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
		(blank)	(blank)	0.76
	Pine-Oak Mix	Thin	Traditional Ground Based with Feller/Skidder	0.13
	(blank)	Fuel Break	Hand Thin with Chainsaws	0.01
			Traditional Ground Based with Feller/Skidder	0.24
		Thin	Traditional Ground Based with Feller/Skidder	0.00
		(blank)	(blank)	0.28
Mt. Tritle - MSO Core	**Dry Mixed Conifer**	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.19
			Traditional Ground Based with Feller/Skidder	0.40
	(blank)	Fuel Break	Traditional Ground Based with Feller/Skidder	0.23
Palace Station - MSO PAC	**Chaparral**	Thin	Traditional Ground Based with Feller/Skidder	5.72
	Madrean Woodland	Thin	Steep Ground Based (Ponsse etc.)	0.50
			Traditional Ground Based with Feller/Skidder	71.89
	Oak Woodland	Fuel Break	Traditional Ground Based with Feller/Skidder	20.33
		Thin	Steep Ground Based (Ponsse etc.)	40.13
			Traditional Ground Based with Feller/Skidder	273.87
	Pine-Oak Mix	Thin	Steep Ground Based (Ponsse etc.)	18.36
			Traditional Ground Based with Feller/Skidder	121.80
Palace Station - MSO Core	**Madrean Woodland**	Thin	Traditional Ground Based with Feller/Skidder	16.95
	Oak Woodland	Fuel Break	Traditional Ground Based with Feller/Skidder	0.05
		Thin	Steep Ground Based (Ponsse etc.)	8.75
			Traditional Ground Based with Feller/Skidder	42.94
Payoff - MSO PAC	**Oak Woodland**	Thin	Traditional Ground Based with Feller/Skidder	0.88
	Pine	Thin	Traditional Ground Based with Feller/Skidder	0.01
	Pine-Oak Mix	Thin	Traditional Ground Based with Feller/Skidder	1.52
	(blank)	Thin	Traditional Ground Based with Feller/Skidder	0.29
		(blank)	(blank)	0.10
Payoff - MSO Core	**Madrean Woodland**	Thin	Traditional Ground Based with Feller/Skidder	0.06

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
	Oak Woodland	Thin	Traditional Ground Based with Feller/Skidder	0.08
	Pine	Thin	Traditional Ground Based with Feller/Skidder	0.01
	(blank)	Thin	Traditional Ground Based with Feller/Skidder	0.30
		(blank)	(blank)	0.01
Silver Spruce - MSO PAC	**Chaparral**	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	6.63
			Traditional Ground Based with Feller/Skidder	1.31
		Thin	Steep Ground Based (Ponsse etc.)	4.84
			Traditional Ground Based with Feller/Skidder	4.03
	Madrean Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.44
			Traditional Ground Based with Feller/Skidder	2.61
		Thin	Steep Ground Based (Ponsse etc.)	3.01
			Traditional Ground Based with Feller/Skidder	9.07
	Dry Mixed Conifer	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	2.95
			Traditional Ground Based with Feller/Skidder	59.67
		Thin	Steep Ground Based (Ponsse etc.)	21.80
			Traditional Ground Based with Feller/Skidder	39.65
	Oak Woodland	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.30
			Traditional Ground Based with Feller/Skidder	1.37
		Thin	Steep Ground Based (Ponsse etc.)	24.63
			Traditional Ground Based with Feller/Skidder	5.74
	Pine	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.29
			Traditional Ground Based with Feller/Skidder	19.08
		Thin	Traditional Ground Based with Feller/Skidder	1.96
	Pine-Oak Mix	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	18.37
			Traditional Ground Based with Feller/Skidder	56.88
		Thin	Steep Ground Based (Ponsse etc.)	101.27

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Traditional Ground Based with Feller/Skidder	163.54
Silver Spruce - MSO Core	**Dry Mixed Conifer**	Fuel Break	Traditional Ground Based with Feller/Skidder	6.34
		Thin	Steep Ground Based (Ponsse etc.)	1.30
			Traditional Ground Based with Feller/Skidder	52.81
	Pine-Oak Mix	Fuel Break	Traditional Ground Based with Feller/Skidder	3.63
		Thin	Steep Ground Based (Ponsse etc.)	0.82
			Traditional Ground Based with Feller/Skidder	2.87
Snowdrift - MSO PAC	**Chaparral**	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	2.27
			Traditional Ground Based with Feller/Skidder	1.05
		Thin	Steep Ground Based (Ponsse etc.)	8.31
			Traditional Ground Based with Feller/Skidder	2.22
	Dry Mixed Conifer	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	20.02
			Traditional Ground Based with Feller/Skidder	23.70
		Thin	Steep Ground Based (Ponsse etc.)	45.21
			Traditional Ground Based with Feller/Skidder	33.14
	Oak Woodland	Thin	Steep Ground Based (Ponsse etc.)	8.31
			Traditional Ground Based with Feller/Skidder	3.32
	Pine	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.33
			Traditional Ground Based with Feller/Skidder	17.98
		Thin	Steep Ground Based (Ponsse etc.)	1.44
			Traditional Ground Based with Feller/Skidder	0.98
	Pine-Oak Mix	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	13.71
			Traditional Ground Based with Feller/Skidder	14.05
		Thin	Steep Ground Based (Ponsse etc.)	71.58
			Traditional Ground Based with Feller/Skidder	39.59
Snowdrift - MSO Core	**Dry Mixed Conifer**	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	2.93

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Traditional Ground Based with Feller/Skidder	25.22
		Thin	Steep Ground Based (Ponsse etc.)	30.34
			Traditional Ground Based with Feller/Skidder	68.26
		(blank)	(blank)	0.00
	Oak Woodland	Thin	Steep Ground Based (Ponsse etc.)	2.78
			Traditional Ground Based with Feller/Skidder	0.22
	Pine	Fuel Break	Traditional Ground Based with Feller/Skidder	4.70
		Thin	Traditional Ground Based with Feller/Skidder	1.68
	Pine-Oak Mix	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	2.69
			Traditional Ground Based with Feller/Skidder	6.52
		Thin	Steep Ground Based (Ponsse etc.)	14.97
			Traditional Ground Based with Feller/Skidder	4.13
Towers - MSO PAC	**Chaparral**	Fuel Break	Hand Thin with Chainsaws	6.79
			Steep Ground Based (Ponsse etc.) or Cable Harvest	0.29
			Traditional Ground Based with Feller/Skidder	1.94
		Thin	Hand Thin with Chainsaws	8.72
			Traditional Ground Based with Feller/Skidder	1.52
	Dry Mixed Conifer	Fuel Break	Hand Thin with Chainsaws	13.61
			Steep Ground Based (Ponsse etc.) or Cable Harvest	12.38
			Traditional Ground Based with Feller/Skidder	61.14
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.52
		Thin	Hand Thin with Chainsaws	13.55
			Steep Ground Based (Ponsse etc.)	37.12
			Traditional Ground Based with Feller/Skidder	94.52
	Oak Woodland	Fuel Break	Hand Thin with Chainsaws	10.36
			Steep Ground Based (Ponsse etc.) or Cable Harvest	49.44

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Traditional Ground Based with Feller/Skidder	23.24
		Thin	Hand Thin with Chainsaws	2.17
			Steep Ground Based (Ponsse etc.)	26.70
			Traditional Ground Based with Feller/Skidder	8.68
		(blank)	(blank)	3.83
	Pine	Fuel Break	Hand Thin with Chainsaws	6.60
			Steep Ground Based (Ponsse etc.) or Cable Harvest	2.41
			Traditional Ground Based with Feller/Skidder	68.23
		Thin	Hand Thin with Chainsaws	0.16
			Steep Ground Based (Ponsse etc.)	0.69
			Traditional Ground Based with Feller/Skidder	29.59
	Pine-Oak Mix	Fuel Break	Hand Thin with Chainsaws	16.54
			Steep Ground Based (Ponsse etc.) or Cable Harvest	63.86
			Traditional Ground Based with Feller/Skidder	74.79
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.42
		Thin	Hand Thin with Chainsaws	26.06
			Steep Ground Based (Ponsse etc.)	9.19
			Traditional Ground Based with Feller/Skidder	25.16
	PJ Woodland	Fuel Break	Traditional Ground Based with Feller/Skidder	1.12
		Thin	Steep Ground Based (Ponsse etc.)	1.18
			Traditional Ground Based with Feller/Skidder	2.19
Towers - MSO Core	**Dry Mixed Conifer**	Fuel Break	Hand Thin with Chainsaws	2.90
			Steep Ground Based (Ponsse etc.) or Cable Harvest	2.84
			Traditional Ground Based with Feller/Skidder	4.42
		Thin	Hand Thin with Chainsaws	29.53
			Steep Ground Based (Ponsse etc.)	5.37
			Traditional Ground Based with Feller/Skidder	15.94
	Oak Woodland	Fuel Break	Hand Thin with Chainsaws	11.64
			Steep Ground Based (Ponsse etc.) or Cable Harvest	1.27

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
			Traditional Ground Based with Feller/Skidder	5.04
		Thin	Hand Thin with Chainsaws	11.96
			Steep Ground Based (Ponsse etc.)	1.01
			Traditional Ground Based with Feller/Skidder	2.21
	Pine	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.00
			Traditional Ground Based with Feller/Skidder	7.03
	Pine-Oak Mix	Fuel Break	Hand Thin with Chainsaws	2.50
			Steep Ground Based (Ponsse etc.) or Cable Harvest	1.61
			Traditional Ground Based with Feller/Skidder	5.66
		Thin	Hand Thin with Chainsaws	21.73
			Steep Ground Based (Ponsse etc.)	1.57
			Traditional Ground Based with Feller/Skidder	10.20
Venezia - MSO PAC	**Madrean Woodland**	Thin	Hand Thin with Chainsaws	21.59
			Steep Ground Based (Ponsse etc.)	10.57
			Traditional Ground Based with Feller/Skidder	10.20
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.79
	Oak Woodland	Thin	Hand Thin with Chainsaws	31.47
			Steep Ground Based (Ponsse etc.)	42.70
			Traditional Ground Based with Feller/Skidder	92.04
			Winch Assist Steep Ground Based (Ponsse) or Cable	13.08
	Pine-Oak Mix	Fuel Break	Steep Ground Based (Ponsse etc.) or Cable Harvest	0.46
		Thin	Hand Thin with Chainsaws	25.26
			Steep Ground Based (Ponsse etc.)	97.11
			Traditional Ground Based with Feller/Skidder	195.17
			Winch Assist Steep Ground Based (Ponsse) or Cable	0.46
Venezia - MSO Core	**Oak Woodland**	Thin	Hand Thin with Chainsaws	10.78
			Steep Ground Based (Ponsse etc.)	6.71
			Traditional Ground Based with Feller/Skidder	25.68

Table 23. Acres of treatment by tool by MSO PAC, Core, or Recovery habitat				
MSO Habitat	**PNVT**	**Treatment**	**Operations**	**Acres**
	Pine-Oak Mix	Thin	Hand Thin with Chainsaws	9.81
			Steep Ground Based (Ponsse etc.)	24.62
			Traditional Ground Based with Feller/Skidder	24.97
Grand Total				**10605.02**

Appendix D: Monitoring plan

The following table lists the various methods proposed for monitoring the various metrics used in this analysis for the effects to MSO and the MSO PACs, Cores, and Recovery Habitat.

Table 24. Mexican spotted owl Monitoring Plan for Hassayampa Project			
MSO Habitat or component	**Metric**	**Pre-treatment monitoring method**	**Post-treatment monitoring method**
MSO Species	Species occupancy	Survey to protocol 2 years prior to treatment per MSO RP	Survey for 3 years post-treatment then alternating years after that
MSO PAC Habitat	Diversity of patch sizes (2.5 ac +)	Explore opportunity for comparisons of LIDAR or annual satellite imagery and possibility of developing partnership with NAU/ERI/ERAU and others to develop model for imagery	
	Horizontal and vertical heterogeneity	LIDAR or Satellite imagery and photo points	
	Tree species diversity – hardwoods and shade-tolerant	Stand exam data and photo points – Partnership opportunities with Prescott College & ERAU and others	
	Diverse composition of herbaceous and shrub species	Photo points - Partnership opportunities with Prescott College & ERAU and others	
	Opening sizes (0.1-2.5 acres)	Satellite imagery	Implementation monitoring
	Minimum canopy cover of 40% P/O, 60% M/C	LIDAR or Satellite imagery modelling or Basal Area correlation from stand exam	
	Diversity of tree sizes; 16"+ >50%BA	Stand exam - Partnership opportunities with Prescott College & ERAU and others	
	Pine-oak BA 60-110 BA		
	Pine-oak Fuel break 60-80 BA		
	Dry mixed conifer BA 100-140 BA		
	Dry mixed conifer Fuel break 100-120 BA		
MSO Core Habitat	Pine-oak BA 90-130 BA	Stand exam - Partnership opportunities with Prescott College & ERAU and others	
	Pine-oak Fuel break 60-80 BA		
	Dry mixed conifer BA 110-150 BA		
	Dry mixed conifer Fuel break 100-120 BA		
MSO Recovery Habitat	Pine-oak BA 60-110	Stand exam - Partnership opportunities with Prescott College & ERAU and others	
	Dry mixed conifer BA 80-120		
MSO Recovery Habitat – N/R Replacement	Pine-oak BA 110	Stand exam - Partnership opportunities with Prescott College & ERAU and others	
	Dry mixed conifer BA 120		
	% BA 12-18" dbh (>30)		
	% BA 18"+ dbh (>30)		
	18"+ dbh TPA (12+)		

Appendix E: Eagle Request for Technical Assistance

This appendix shares the anticipated effects of the project to eagles and requests Technical Assistance from the USFWS in complying with the Bald and Golden Eagle Protection Act for this project.

This assessment documents whether or not "take" of bald or golden eagles protected under the Bald and Golden Eagle Protection Act (B&GEPA) is expected to occur under the selected alternative. In the B&GEPA "take" is defined to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb." The USDI USFWS subsequently defined "disturb" as follows: "Disturb means to agitate or bother a bald eagle or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (*Federal Register* volume 72, number 107, page 31132, June 5, 2007). Table compares the known habitat and distribution for each species with the project area and proposed action.

Table 25. Federally protected species under the Bald and Golden Eagle Protection Act of 1940, as amended

Species **Common Name** ***Scientific Name***	**Known Distribution or Habitat Association for the Species**	**Project Information (Project Area Is in Several Different Vegetation Types Within The Hassayampa Basin)**
Bald Eagle *Haliaeetus leucocephalus*	**Distribution:** A small resident population of approximately 40 pairs nests primarily along the Salt and Verde Rivers. Lynx Lake is a nesting site. **Habitat:** Nesting in Arizona typically occurs on cliff faces, pinnacles, and ledges, generally within 600 feet of water or in pine habitats within 1 mile of larger water bodies.	Suitable breeding or foraging habitat does not occur within the project area, so there would not be any take of bald eagles with this project.
Golden Eagle *Aquila chrysaetos canadensis*	There is suitable golden eagle habitat within the project area and an Arizona Game and Fish Department labeled as a golden eagle nest, although upon closer inspection the record states "middle cliffs…possible hawk nest". The site is located near the northern terminus of Forest Service Road 86 on the border of Juniper Woodland and Interior Chaparral PNVTs. It is within the Goodwin Fire perimeter and burned at moderate severity. Although a golden eagle nestling was found on the road to Crown King within the project area in 2013 (Map 47 below), no nest site was confirmed for this breeding area. Other suitable nesting sites may occur within the project area.	Suitable breeding habitat is present within the project area (Map 47 below).

Golden Eagle

Assessment of Take/Disturbance

A combination of mechanical treatments, hand thinning, and prescribed burning are proposed in the project area. Within a 0.5 mile buffer (502 acres) around the nest site documented by Arizona Game and Fish Department, 466 acres are located on National Forest System lands and 36 acres are on privately-held lands. Of the 466 acres on National Forest System lands, 21 acres are currently proposed for hand thinning, 375 acres are proposed for mechanical thinning, 51 acres are proposed for mechanical fuelbreak thinning, and 466 acres are proposed for prescribed fire. The proposed action also includes adaptive management specific to golden eagles.

Treatments occurring in the upland portions of the landscape may present occasions for disturbance impacts to nesting and foraging golden eagles including disturbance from machinery, people, and smoke. With golden eagle nest sites typically located on rock cliffs or bluffs, most impacts or changes would occur within foraging habitat. Substantial interference with the availability of prey for golden eagles could be considered enough to "disturb" eagles enough to warrant a "take." Activities occurring during the breeding season can flush golden eagles from the nest and cause nest failure. Golden eagles have been observed to be sensitive to disturbances from construction activities involving equipment and personnel within 1 mile of nest sites (K. Jacobson, Arizona Game and Fish Department, *personal communication*).

As stated in Guide-WL2 of the Prescott LRMP, design features should be incorporated into Forest Service projects as needed to ensure compliance with Federal laws, including the Bald and Golden Eagle Protection Act. For golden eagle management, management recommendations based on the most current agency direction or best available scientific information will be implemented to avoid "take" under the Bald and Golden Eagle Protection Act (environmental assessment, appendix A, C-8). Currently, the best available science to avoid take is based on technical assistance provided by USDI USFWS for the Four Forest Restoration Initiatives and recommends:

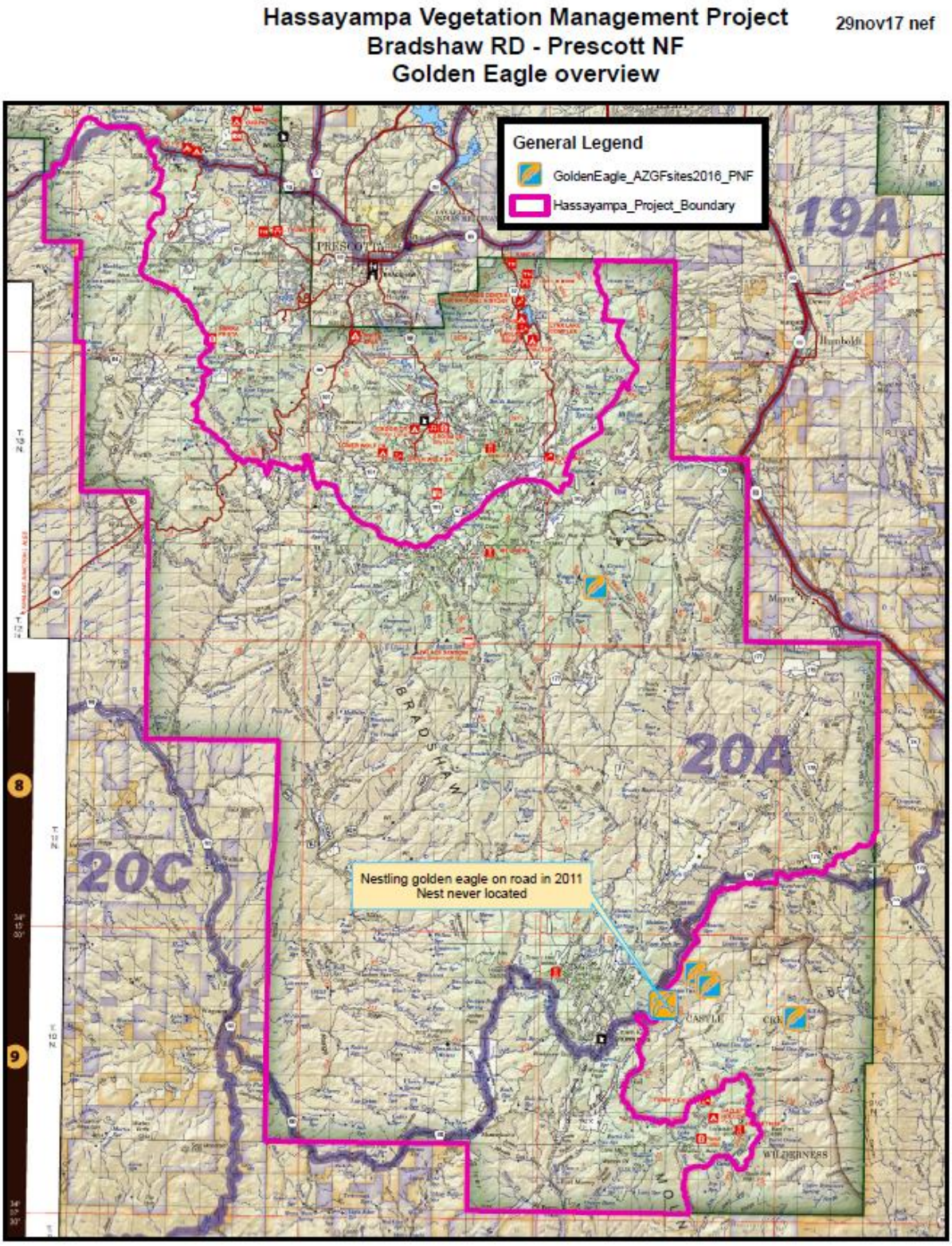
- Prescriptions near golden eagle nest trees and nest sites would be designed to protect them from disturbance. Temporal buffers will be determined on an annual basis in coordination with USDI USFWS and AZGFD.
- The Forest Service will coordinate with USDI USFWS and AZDGF to ensure that golden eagle nest location data are updated annually or as new data are collected.
- *Buffer Zone:* No vegetation treatments will occur within 0.5 mile (2,500 feet) of an occupied golden eagle nest during the breeding season (January15-July31), unless noise effects would be mitigated by topography.
- In addition, during discussions with USFWS in June 2019, they shared that there is zero tolerance for any smoke impacts to golden eagle nests during the breeding season.

These would apply to the occupied nest sites. Topography, vegetation, and current on-going baseline activities would be assessed to adjust nest buffers to account for ongoing activities and avoid disturbance impacts from new activities.

Bald & Golden Eagle Protection Act Assessment:

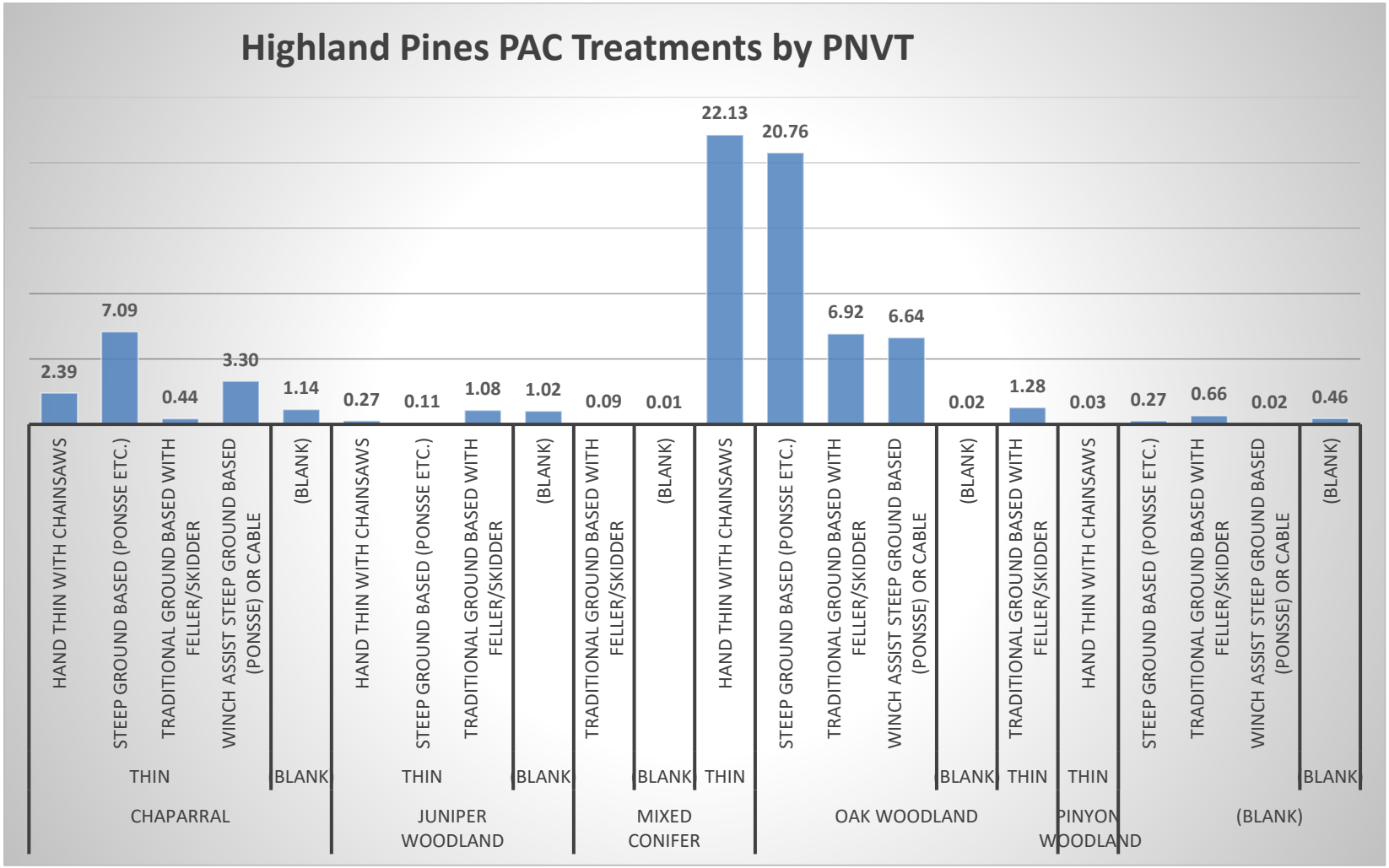
Based on the effects analyses above,

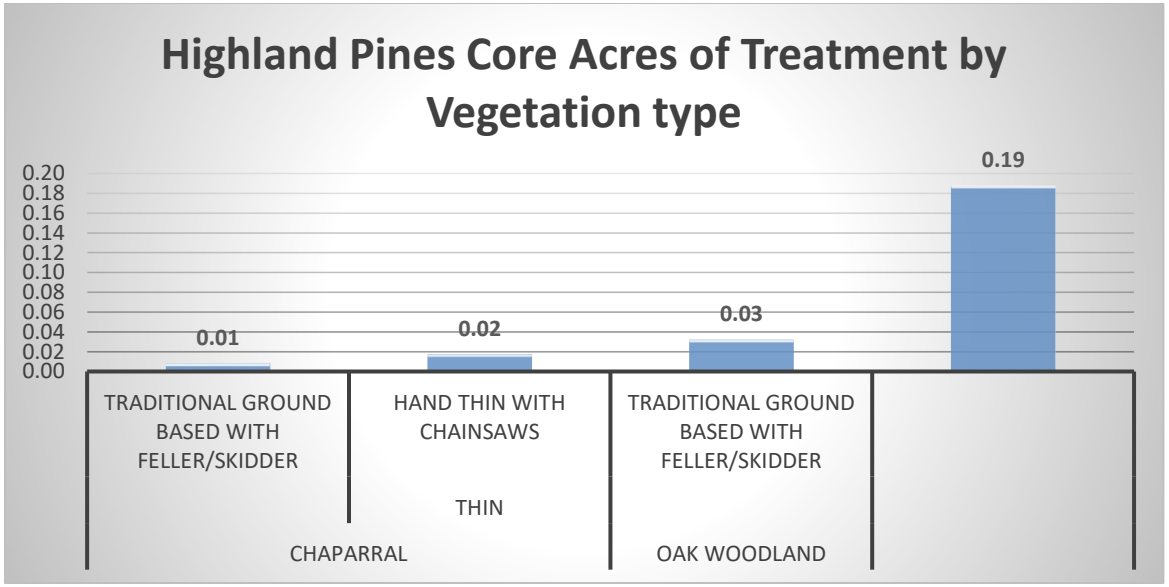
- ✓ I find that this project will not result in take to federally protected bald and golden eagles.



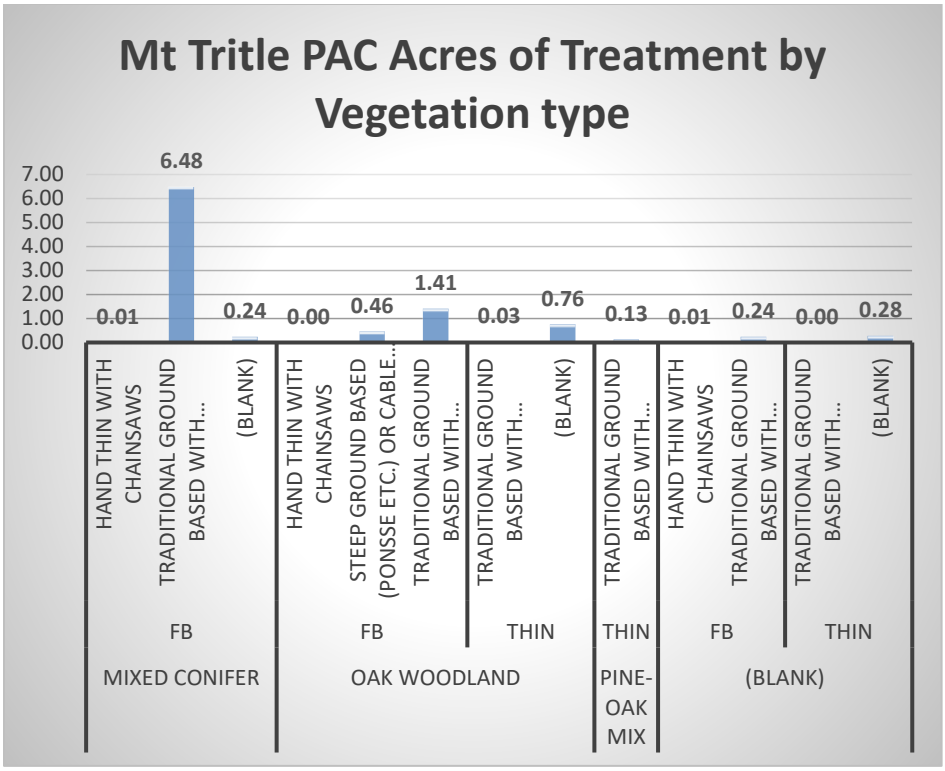
Map 47. Known Golden eagle sites in or near the Hassayampa Project area.

BA- Amendment I – from consultation with FWS

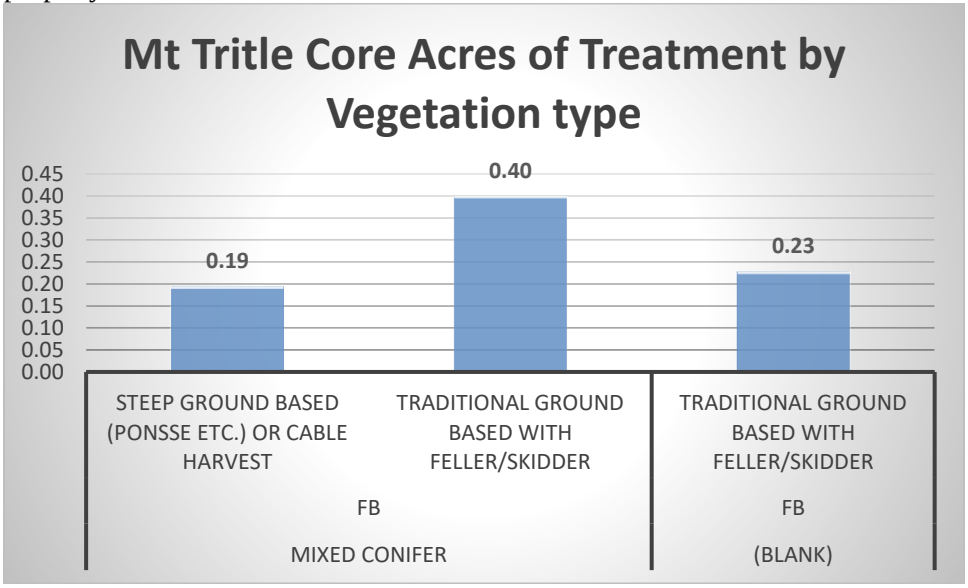




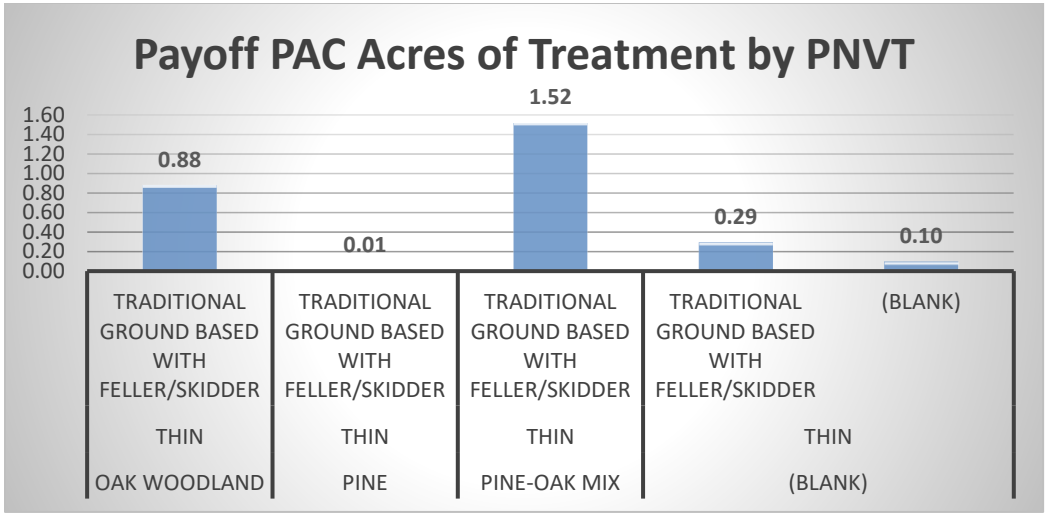
With less than 3/10 of an acre in the core, this was not separately addressed. It was addressed in Table 16 on page 56. For the 76 acres within the PAC that are to be treated, there are no fuel breaks, only thinning to reduce the risk of fire within the PAC.



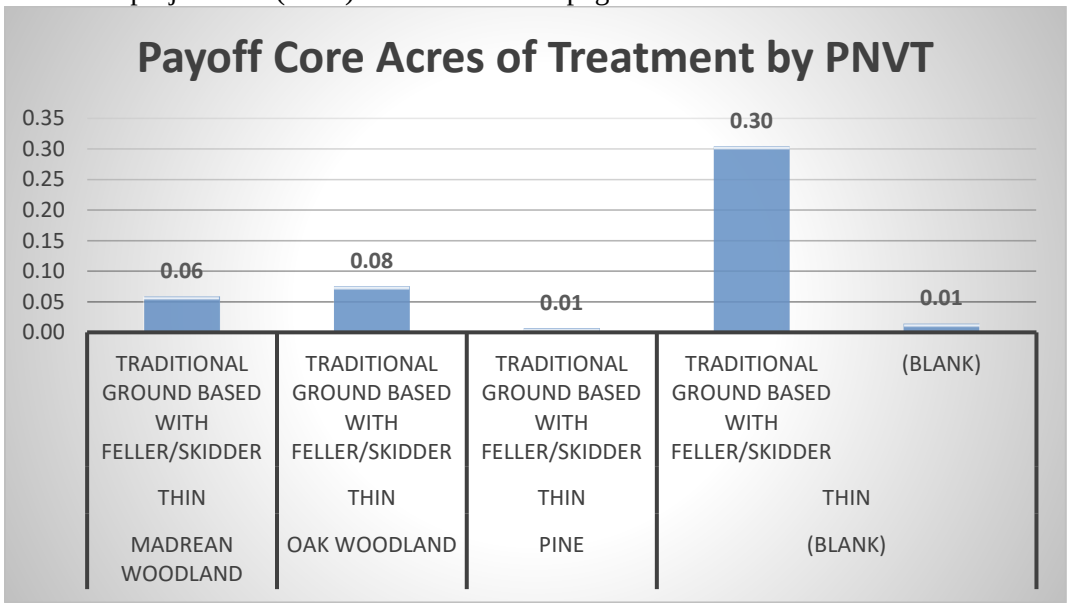
Most of the treatment within the Tritle PAC is fuel break in the dry mixed conifer adjacent to private property.



Less than 1 acre of fuel break in the core was addressed in Table 16 on page 56.



This PAC is not adjacent to private property, is primarily pine dominated and will only be thinned to reduce risk of fire for the 3 acres that may lie within the project area (GIS?). See Table 16 on page 56.

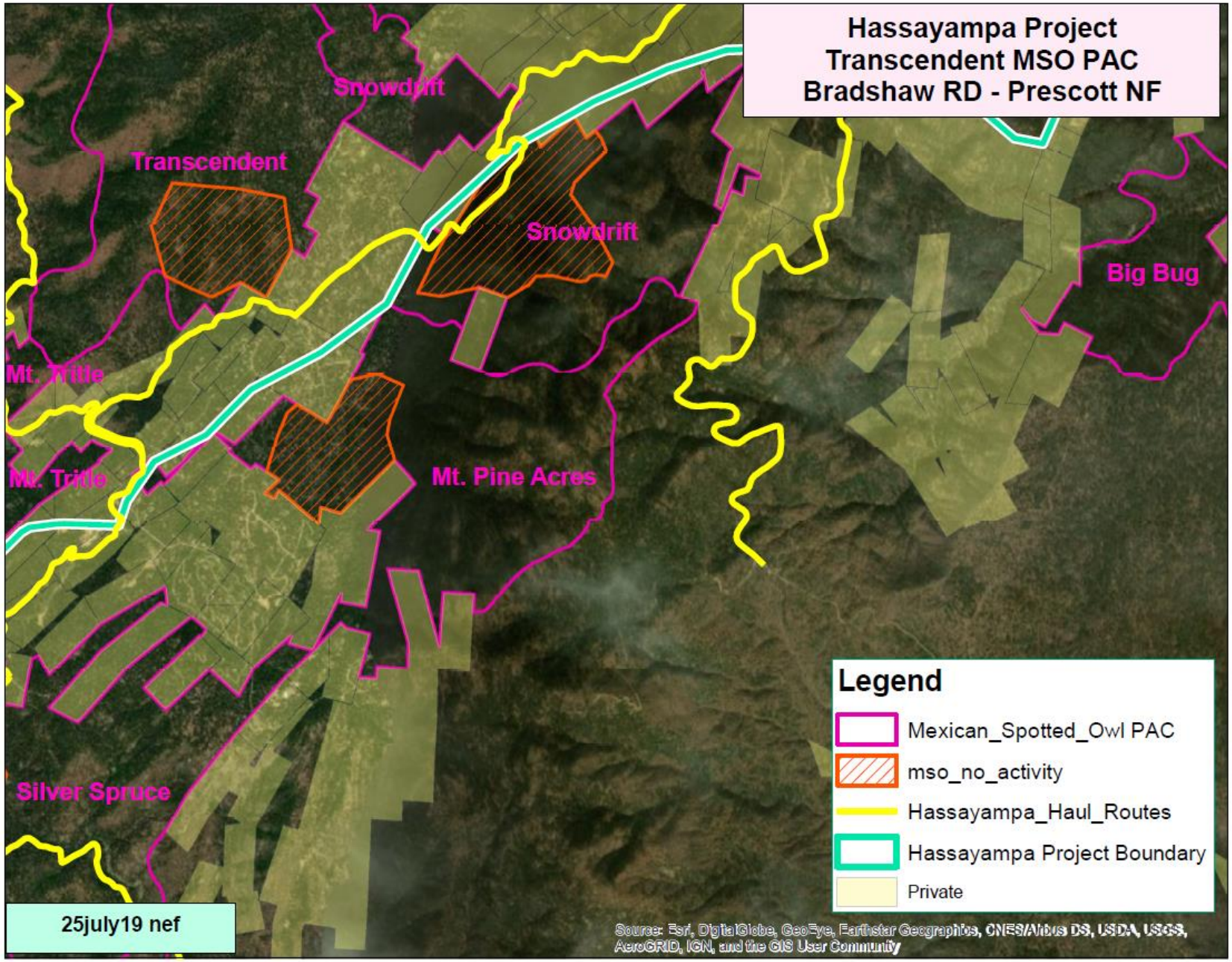


Less than 1 acre would be thinned in this PAC. See Table 16 on page 56.

Cumulative monitoring history for Transcendent MSO PAC -	
Updated 26Sept18 nef	Transcendent 03090312
1989	MU
1990	MU
1991	MU
1992	O, NU
1993	NM (X)
1994	IM, M,NU
1995	NM (X)
1996	NM
1997	NM
1998	IM, NR
1999	NM
2000	NM
2001	IM, NR
2002	A
2003	O, NU; ADJ= P
2004	A
2005	P, NU
2006/2007	NM
2008	NM
2009	O
2010	NM
2011	NM
2012	NM
2013	NM
2014	P
2015	A
2016	NM
2017	O
2018	P

PAC Occupancy:	Breeding Status:
NR= No response (informal/ partial monitoring)	Y = Number of young fledged
A = Absent (formally monitored to protocol/ 4 visits)	YD = Number of young found dead
O = Occupied by pair	NF = Nest failed or abandoned
P = Presence of a single owl, sex unknown	NN =Not nesting
F = Single female owl	NU = Nesting status undetermined
M = Single male owl	**Monitoring Status**
Sub = 1 or 2 year-old subadult	NM = Not Monitored
ADJ = Detection of an MSO in this PAC that is primarily using an adjacent PAC/ area	X= Not established as a PAC at that time
	IM = Informal/ Partial Monitoring
	MU= Monitoring Unknown

The Transcendent MSO PAC is more than ¼ mile outside of the Hassayampa project area (Map 1). Likely impacts from the project include smoke impacts to a pair of owls from adjacent RX burning. Topography between the project area and the PAC may influence smoke to move away from the PAC and to the south. With private property with homes between the project area and the PAC and the topography, disturbance from vegetation treatments on the other side of the ridge is not likely to be a factor for these owls.
Noting the haul route adjacent to the no activity center, there could be disturbance impacts to a pair of owls from hauling on this route. The only loads planned to come by the Transcendent PAC would be those few coming from the Mtn Pine Acres PAC. All others would go out the Senator Highway.


Hassayampa Project
Transcendent MSO PAC
Bradshaw RD - Prescott NF
Snowdrift
Transcendent
Snowdrift
Big Bug
Mt. Tritle
Mt. Tritle
Mt. Pine Acres
Silver Spruce
Legend
Mexican_Spotted_Owl PAC
mso_no_activity
Hassayampa_Haul_Routes
Hassayampa Project Boundary
Private
25july19 nef
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

D:\1Working